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REPORT TO U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WASTE PROGRAMS ENFORCEMENT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY FINAL WORKPLAN

MONTROSE FACILITY SITE
(TORRANCE, CALIFORNIA)

October 1984

Prepared by:

METCALF & EDDY, INC.
1029 Corporation Way
Palo Alto, California 94303

The work upon which this publication is based was performed under Subcontract to GCA/ Technology Division, under Contract to U.S. Environmental Protection Agency.

EPA Work Assignment No. 84-299
GCA Work Assignment No. 84-299-002-14

EPA Contract No. 68-01-6769
GCA Contract No. 1-625-999-222-002

1014-B20A

Metcalf & Eddy | Engineers

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SECTION 1

INTRODUCTION

Section 1

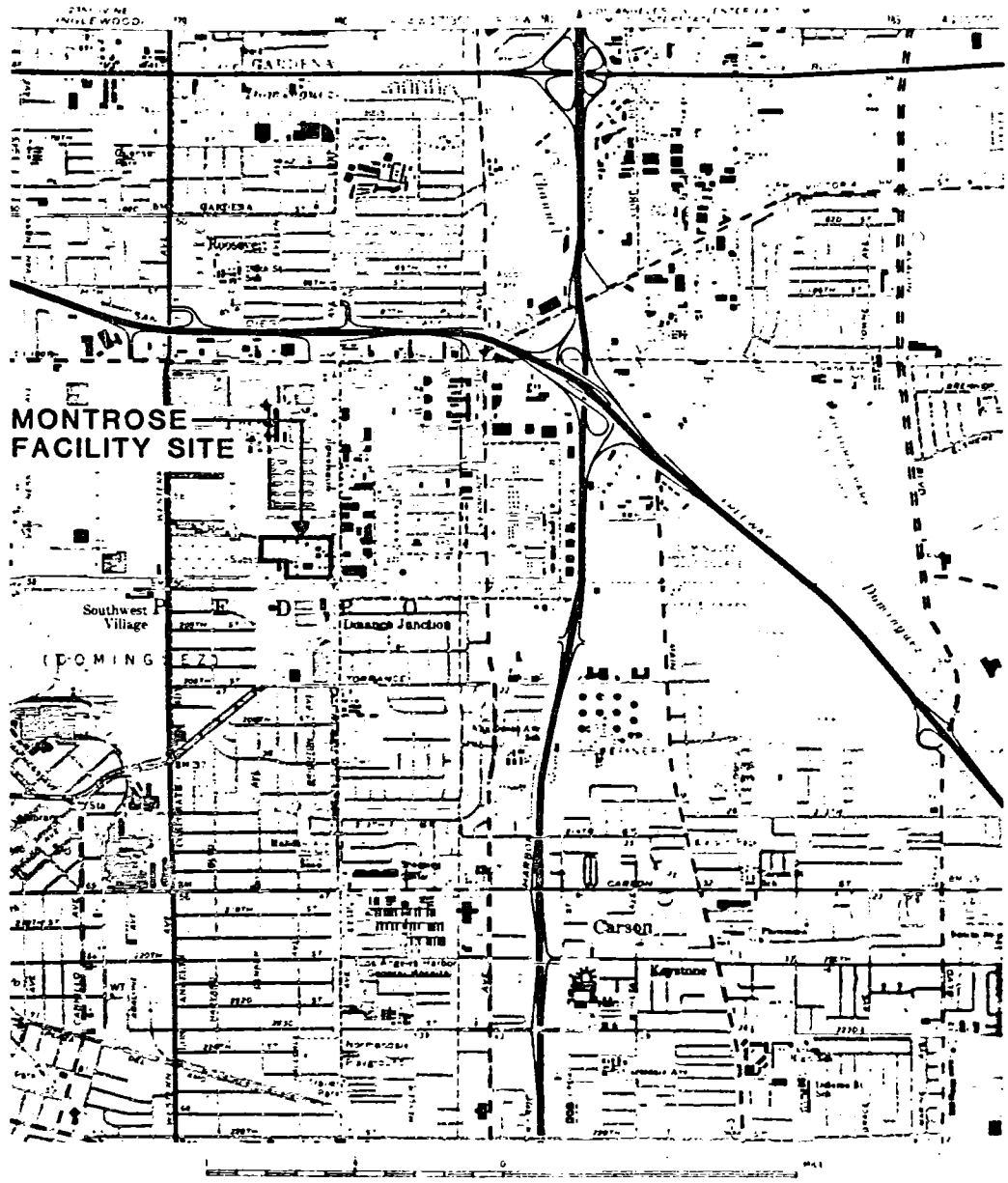
INTRODUCTION

Work plans have been developed for a Remedial Investigation (RI) and Feasibility Study (FS) for the Montrose Chemical Company site in Torrance, California. EPA expects that Montrose Chemical will conduct the field sampling required for the RI, with EPA providing oversight by observing the sampling and collecting and analyzing duplicate samples. EPA will evaluate the sampling results and conduct the Feasibility Study to recommend the appropriate remedial action(s) to mitigate identified public health and environmental effects. The RI/FS is expected to take 14 months.

BACKGROUND

The Montrose Facility site covers approximately 13 acres on Normandie Avenue in Torrance, California (Figure 1). From 1947 to 1982, the pesticide DDT was manufactured and/or processed at this site. Due to its persistence and toxic effects on wildlife, DDT use was banned in the United States in 1972, and it is now listed as an EPA Priority Pollutant. Montrose Chemical has ceased operations and demolished the DDT manufacturing facility and has proposed to redevelop the property as a warehouse facility.

There is evidence that DDT has been released from the Montrose site into the surrounding environment. In 1982, an EPA investigation found DDT in surface water runoff and sediments leaving the Montrose property. High concentrations of DDT have been identified in sewers which received Montrose wastes prior to 1972, and also in portions of the Dominguez Channel and Los Angeles Harbor. It has been reported that grinding of DDT done at Montrose may have resulted in aerial dispersion of DDT throughout the surrounding area.



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP: TORRANCE, CALIFORNIA, 1972

FIGURE 1. VICINITY MAP - MONTROSE FACILITY SITE
TORRANCE, CALIFORNIA

Montrose Chemical is presently under enforcement orders issued by both EPA and the California Regional Water Quality Control Board. The orders, issued as a result of the 1982 investigation, require (1) prevention of DDT releases from the property, (2) sampling soils and surface water, and (3) design and implementation of remedial action. In response, Montrose built a berm intended to prevent stormwater runoff from leaving the property, presented results of a soil sampling program, and submitted its property redevelopment plans, which showed pavement over most of the site. EPA reviewed these redevelopment plans, accepted comments from state and local agencies and the public, and held a public meeting.

The sampling results showed on-site soils to contain 300-400 tons of DDT, with surface soils exceeding state hazardous waste criteria by two to five orders of magnitude. These results provided a basis for EPA to re-evaluate the potential hazard posed by this site, and Montrose has now been proposed for inclusion on the National Priority List, making it eligible for federal funds ("Superfund") for investigation and selection and implementation of remedial action. Due to the extensive public comment received and its status as a proposed Superfund site, the RI/FS work plans will be implemented to ensure that remedial action(s) will be selected in accordance with federal policy as outlined in the National Contingency Plan.

WORK PLAN SUMMARIES

Federal policy requires that selection of remedial actions be based on a comprehensive comparison of the possible actions based on effectiveness measures such as:

- Technical status
- Risk and effect of failure
- Level of clean-up/isolation achievable
- Ability to minimize community impacts during implementation
- Ability to meet relevant public health and environmental criteria
- Time required to achieve clean-up/isolation

These assessments are done during the Feasibility Study Phase. Site-specific information is necessary to perform the detailed assessments in the FS; this information is collected during the Remedial Investigation (RI) phase.

Remedial Investigation. A two-part field investigation will be conducted. After reviewing existing data and developing detailed sampling protocols, Part 1 samples of on-site soil and groundwater will be collected and analyzed for a wide range of chemicals to broadly characterize the type and location of contamination. Soil samples as deep as 10 feet will be analyzed, and five monitoring wells will be installed in the uppermost aquifer. Part 1 results will be evaluated by EPA and interested agencies and a list of Target Chemicals will be identified. Subsequent (Part 2) investigations into soil, water, and air quality will be limited to those compounds known to be of concern on the Montrose site.

The objective of the Part 2 sampling is to define the extent and location of contamination in sufficient detail to perform the Feasibility Study. All off-site sampling will be conducted in

Part 2, as well as more detailed on-site sampling. Off-site samples will include: surface water and sediment samples along the drainage path from Montrose to the Harbor, sediment samples in the sewers between Montrose and the Water Pollution Control Plant, soil samples in identified former drainage paths from Montrose, soil samples in neighborhoods that may have been affected by aerial dispersion, and air samples from the vicinity of the site. More detailed on-site sampling will include soil samples collected on a denser grid as indicated by the Part 1 results and additional groundwater investigations if the upper aquifer appears to have been contaminated by the Montrose site. A complete RI report incorporating reviews of existing data, and results and evaluation of the Part 1 and 2 sampling programs will be prepared.

Feasibility Study. EPA will review the RI report and public comments on it. A detailed assessment of the public health and environmental risks posed by the site in its present condition (called an Endangerment Assessment) will be performed and objectives for the remedial action(s) will be identified. Several technically feasible remedial alternatives which provide different levels of risk mitigation will then be developed and assessed by the criteria specified above. The most cost-effective - not necessarily the least expensive - remedial alternative will be recommended and described in detail, along with any long-term performance monitoring requirements, in the Feasibility Study report. Final selection of the remedial action(s) will be done by EPA after considering public comments on the Feasibility Study.

SCHEDULE

The complete Remedial Investigation and Feasibility Study is expected to take about 14 months, as shown in Figures 2 and 3. The Remedial Investigation phase consists of 18 tasks and is expected to be completed in 41 weeks. Some tasks are only in one part of the RI phase, while others continue throughout the RI phase. The responsibility for each of the tasks is shown in Table 1.

While the RI Report is being finalized, the conceptual Feasibility Study Work Plan presented in Section 3 of this document will be revised and finalized. The final Feasibility Study Report is due about 4 months after the Remedial Investigation Report has been finalized. During the feasiblity study, all feasible remedial alternatives will be evaluated in detail and one will be selected after consideration of public health, environmental, and other effects. Public comments will be accepted on the Feasibility Study Report before the final decision on remedial action is made.

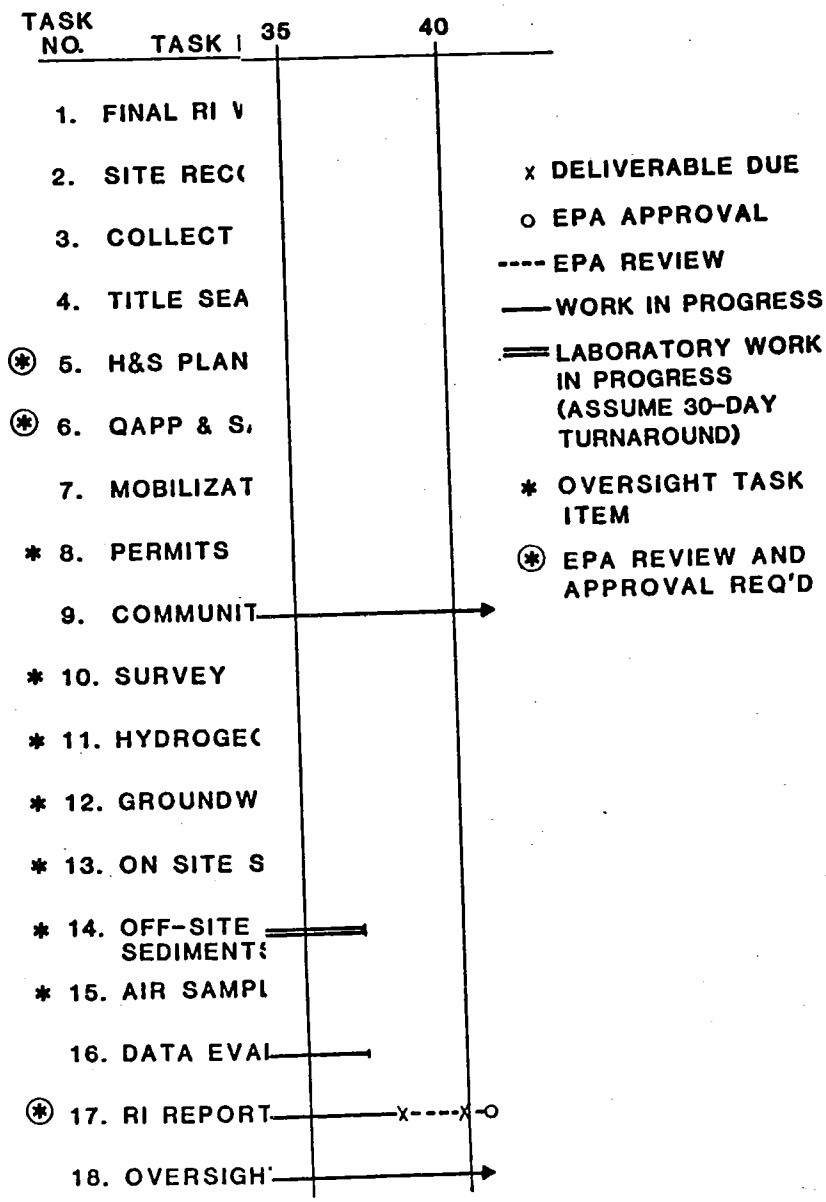


FIGURE 2. REMEDIAL INVESTIGATION SCHEDULE MONTROSE FACILITY SITE

TASK NO.	TASK DE
19	FINAL FS W
20	OBJECTIVES
21	IDENTIFY AL
22	ENDANGERM
23	INITIAL SCR
24	TREATABILI
25	EVALUATE /
26	PRELIMINAR
27	POSTCLOSU
28	FINAL FS RE
29	CONCEPTUA
30	COMMUNITY

x DELIVERABLE DUE

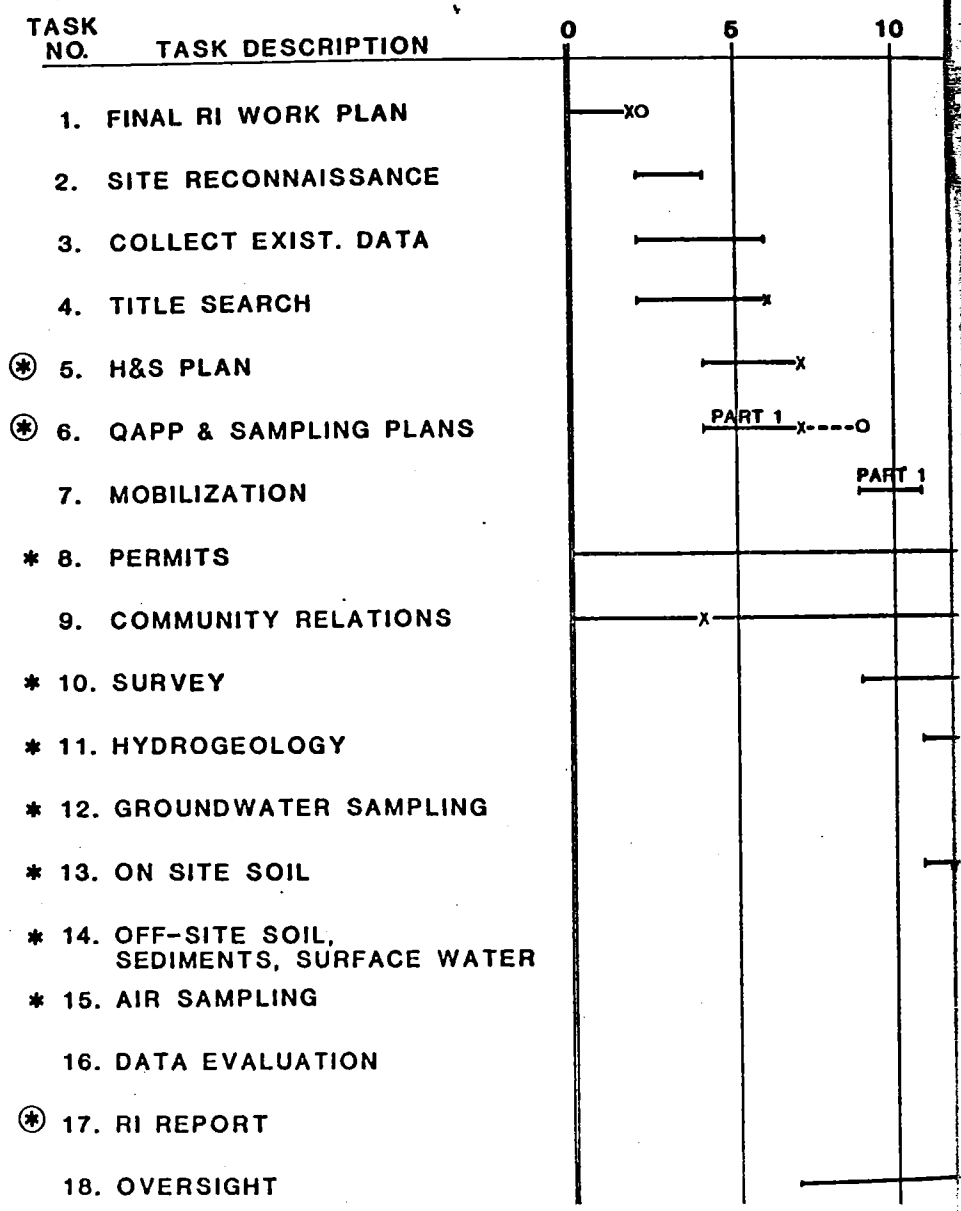
o EPA APPROVAL

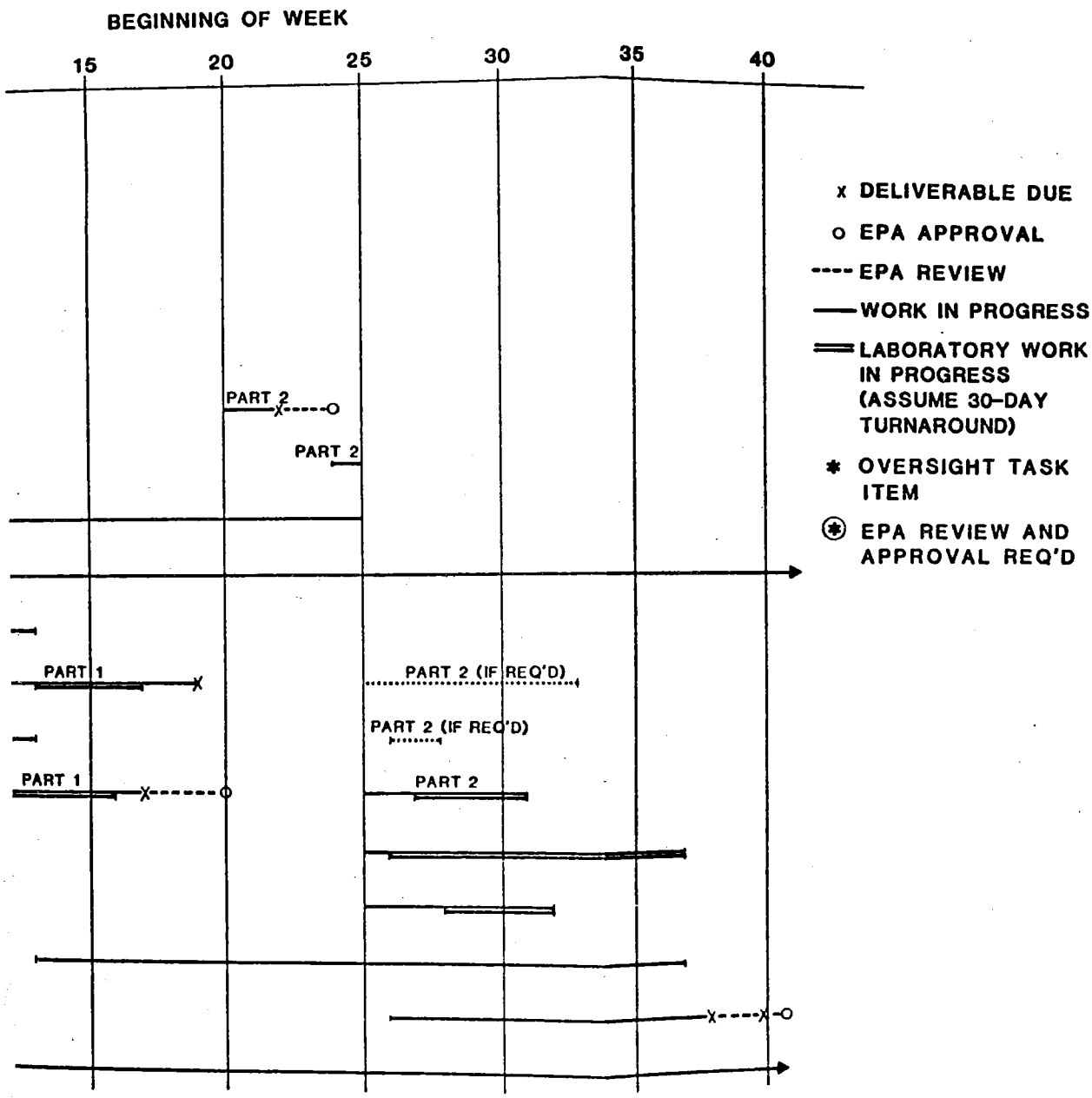
---- EPA REVIEW

—— WORK IN PROGRESS

═══ LABORATORY WORK IN PROGRESS (ASSUME 30-DAY TURNAROUND)

FIGURE 3.
FEASIBILITY STUDY SCHEDULE
MONTROSE FACILITY SITE


TASK NO.
TASK DESCRIPTION
0
5
10
1. FINAL RI WORK PLAN
2. SITE RECONNAISSANCE
3. COLLECT EXIST. DATA
4. TITLE SEARCH
⊛ 5. H&S PLAN
⊛ 6. QAPP & SAMPLING PLANS
PART 1
7. MOBILIZATION
PART 1
* 8. PERMITS
9. COMMUNITY RELATIONS
* 10. SURVEY
* 11. HYDROGEOLOGY
* 12. GROUNDWATER SAMPLING
* 13. ON SITE SOIL
* 14. OFF-SITE SOIL, SEDIMENTS, SURFACE WATER
* 15. AIR SAMPLING
16. DATA EVALUATION
⊛ 17. RI REPORT
18. OVERSIGHT



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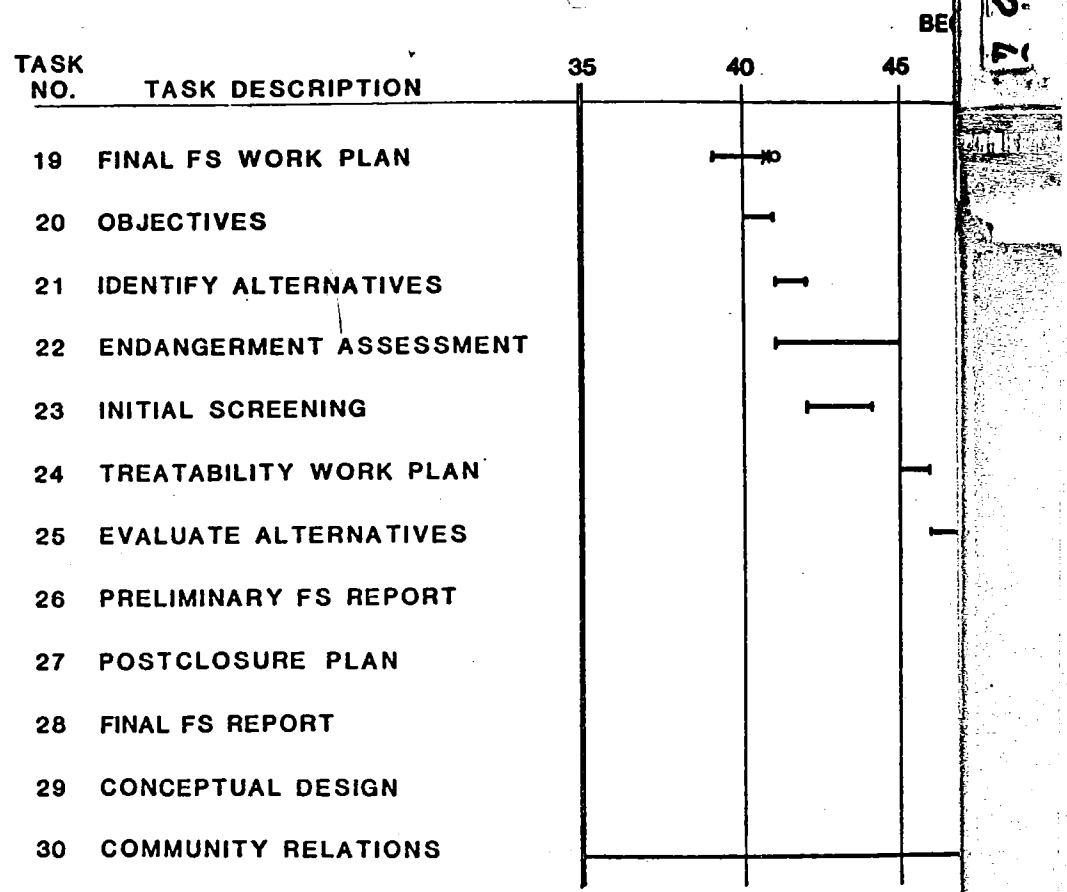
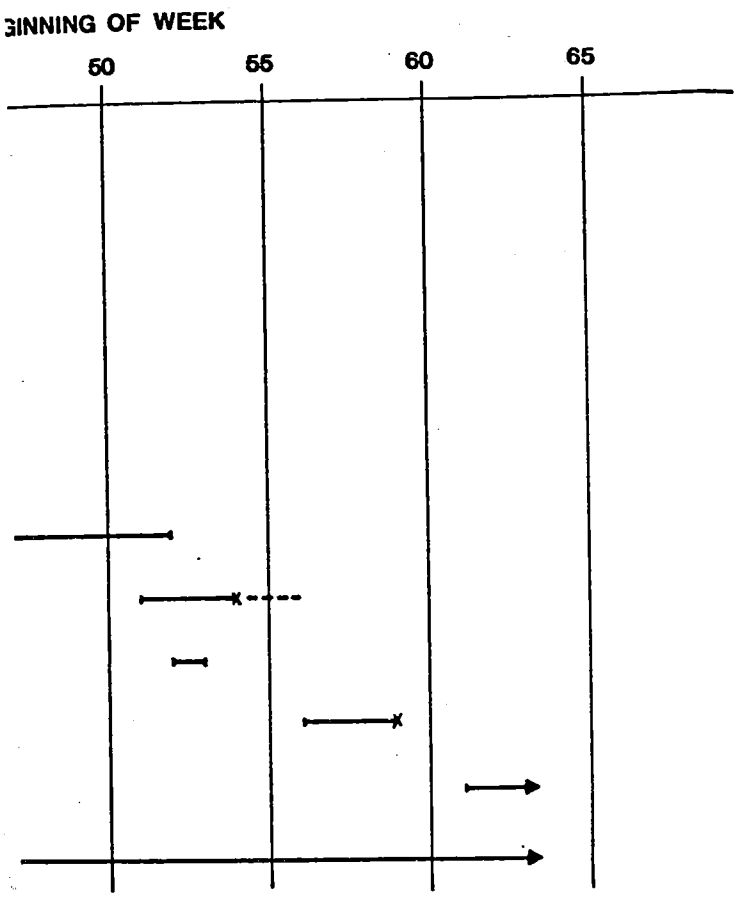

TASK NO.
TASK DESCRIPTION
35
40
45
19 FINAL FS WORK PLAN
20 OBJECTIVES
21 IDENTIFY ALTERNATIVES
22 ENDANGERMENT ASSESSMENT
23 INITIAL SCREENING
24 TREATABILITY WORK PLAN
25 EVALUATE ALTERNATIVES
26 PRELIMINARY FS REPORT
27 POSTCLOSURE PLAN
28 FINAL FS REPORT
29 CONCEPTUAL DESIGN
30 COMMUNITY RELATIONS



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—— WORK IN PROGRESS

═══ LABORATORY WORK IN PROGRESS (ASSUME 30-DAY TURNAROUND)

FIGURE 3.
FEASIBILITY STUDY SCHEDULE
MONTROSE FACILITY SITE

Table 1. WORK PLAN RESPONSIBILITIES

X = Perform Task
R = Review/Approve Written Product
O = Oversee Task Performance

Task No.	Task Description	EPA	Montrose
	Remedial Investigation		
1.	Final RI work plan	X	-
2.	Site reconnaissance	X	X
3.	Collect existing data	X	X
4.	Title search	X	-
5.	H&S plan	R	X
6.	QAPP and sampling plans	R	X
7.	Mobilization	-	X
8.	Permits	O	X
9.	Community relations	X	-
10.	Survey	O	X
11.	Hydrogeology	O	X
12.	Groundwater sampling	O	X
13.	On site soil	O	X
14.	Off site soil, sediments, surface water	O	X
15.	Air sampling	O	X
16.	Data evaluation	O	X
17.	RI report	R	X
18.	Oversight	X	-
	Feasibility Study		
19.	Final FS work plan	X	-
20.	Objectives	X	-
21.	Identify alternatives	X	-
22.	Endangerment assessment	X	-
23.	Initial screening	X	-
24.	Treatability work plan	X	-
25.	Evaluate alternatives	X	-
26.	Preliminary FS report	X	-
27.	Postclosure plan	X	-
28.	Final FS report	X	-
29.	Conceptual design	X	-
30.	Community relations	X	-

SECTION 2

REMEDIAL INVESTIGATION WORK PLAN

Section 2

PHASE I - REMEDIAL INVESTIGATION WORK PLAN

The detailed task descriptions presented below comprise the detailed work plan for the Remedial Investigation (RI) to be conducted for the Montrose Facility Site. This work plan is intended as general guidance on the scope and extent of field investigations. Actual numbers and locations of samples may be adjusted, with EPA approval, based on information obtained in the early tasks (2 and 3). These details will be finalized in the site-specific Health and Safety (H & S) Plan, Quality Assurance Project Plan (QAPP), and Sampling Plans, which will be provided by Montrose Chemical Company and incorporated into the work plan upon approval by EPA.

REMEDIAL INVESTIGATION - PRELIMINARY ACTIVITIES

A total of nine tasks comprise the Preliminary Remedial Investigation Activities. These activities are required before the Site Activity tasks in the remedial investigation can be initiated.

Task 1 - Preparation of Final Remedial Investigation Work Plan (10 days)

This document is the final product of Task 1.

Task 2 - Performance of Site Reconnaissance (10 days)

EPA and Montrose Chemical Co. investigation teams will conduct brief on-site and off-site reconnaissances in order to:

1. Assess potential on-site and off-site health and safety hazards for the subsequent RI. The investigation teams will locate and photograph physical features on a preliminary field plan drawing which may affect sampling activities. Special attention will be paid to identifying drainage systems, including exposed piping and catchbasins, and determining if they are active. All features will be oriented to a field plan grid system. A map of the area will be prepared.

2. Assess the nature and extent of apparent contamination and document waste characteristics for both on-site and offsite areas. The site and downgradient surface water discharge areas (swale, storm drains, channels, sewer manholes) will be inspected visually for presence of sediment.

3. Select and verify appropriate locations for subsequent off-site soil, surface water, and sediment sampling.

4. Select locations for subsequent on-site soil/debris/crushed concrete pile sampling.

5. Perform air characterization for volatiles on-site and in off-site storm drainage/sewer manholes in order to
(a) develop baseline air quality data and/or
(b) determine the level of respiratory protection needed during subsequent remedial investigations.

Some of this information may be obtainable from records available at this time. Verify data, update site conditions, and retrieve additional information as required based on preliminary records search.

A separate Health and Safety Plan will be developed specifically addressing site reconnaissance activities prior to site entry or offsite manhole sampling.

Task 3 - Collection and Evaluation of Additional Existing Data (15-20 days)

It will be necessary for EPA and Montrose Chemical Co. to collect and evaluate additional information which was not available for the preparation of this work plan. This information will help fill data gaps. In addition to EPA files, the following sources of information will be consulted:

- Montrose Chemical Co. for the following sampling results required by EPA Enforcement Order No. 83-01 dated May 6, 1983:

  Order Item I.B. On-site and off-site stormwater sampling from each storm event.

  Order Item II.A. Sampling necessary to support remedial actions to abate MCB contamination of water and soil both on-site and off-site.

  In addition, chemical analyses of sealants used on-site on the stormwater retention berm, property outside the berm, and soil/crushed concrete/debris piles should be requested from Montrose Chemical Co..

- McDonnell-Douglas Co., Jones Chemical Co., the Aluminum Company of America (or present property owner), Martin Marietta, Farmer Brothers Coffee Co., and owners of any other property located adjacent to the Montrose Facility Site, for information on groundwater wells located on their properties.

- Regional Water Quality Control Board for DDT and MCB monitoring results and background information developed for their enforcement order.

- Local drinking water suppliers for information on wells and their depth, construction, location, and water quality.

- South Coast Air Quality Management District, El Monte, California, for information on wind speed and direction and other air monitoring data for the vicinity of the Montrose Facility Site. Archived samples may be available for analysis.

- California Department of Health Services (DOHS) for any air and/or groundwater information which may be contained in their files on the Del Amo (Cadillac-Fairview) hazardous waste site which is located in close proximity to the Montrose Facility Site.

- California Department of Water Resources (DWR) for any local groundwater well log information.

- Los Angeles County Flood Control District for geologic information, groundwater levels, sewer and stormdrain design drawings and hydrologic data, flooding information, and priority pollutant monitoring data.

- Los Angeles County Sanitation District for data on sedimentation in sewers and in the treatment plant and DDT monitoring results.

- Los Angeles County Health Department for any relevant information.

- U.S. Army Corps of Engineers for relevant information regarding harbor dredging and contaminant levels.

- Montrose Chemical Co. for information on personnel or occupational health, air monitoring for DDT or fugitive or source emissions testing.

- National Weather Service, Los Angeles, CA for monthly wind rose or other wind frequency data.

- Local aerial flying service, appropriate state offices, EPA-EPIC aerial photo branch for a review of historical air photos of the site and surrounding neighborhoods. Evidence of chemical wastes and of historical stormwater drainage paths will be evaluated.

- Local/area chamber of commerce, business directories, agriculture services, etc. to determine any other area manufacturers or large-scale users of DDT.

- Chemical manufacturing associations, Montrose Chemical Co. and other reference sources to review DDT manufacturing process and determine products/chemicals used in the manufacturing operation and any byproducts and/or waste products generated.

- U.S. Geological Survey and other appropriate agencies for information on hydraulic properties and interconnection of aquifers, and for water table and potentiometric maps which indicate prevalent groundwater flow direction in the site area.

Data obtained from these and other sources will be used to assist in the site investigation.

Task 4 - Title Search (20 days)

A title search will be conducted by EPA to develop the history of ownership of the Montrose site. Title documents will be collected, land descriptions reviewed, and a sequential listing of owners of each parcel within the current Montrose site boundaries will be prepared. This task includes production of the final History of Ownership report. The information obtained will be used to help determine the potential for unexpected contaminants on the site.

All offsite sample locations will be reviewed and present owners identified so that permission to sample and access to the property may be obtained.

- Local/area chamber of commerce, business directories, agriculture services, etc. to determine any other area manufacturers or large-scale users of DDT.

- Chemical manufacturing associations, Montrose Chemical Co. and other reference sources to review DDT manufacturing process and determine products/chemicals used in the manufacturing operation and any byproducts and/or waste products generated.

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All offsite sample locations will be reviewed and present owners identified so that permission to sample and access to the property may be obtained.

Task 5 - Development of Site Health and Safety Plan (10-15 days)

A site Health and Safety Plan (H&S Plan) will be developed by Montrose Chemical Co. for future investigative and remedial work at the Montrose Facility site. It will reflect all known data on the site, including air characterization performed under Task 2. The H&S Plan will also contain task-specific safety elements because of the varied tasks needed to complete the RI work on- and off-site.

The purpose of the Health and Safety Plan will be to:

- Delineate personal protection requirements and procedures and responsibilities for on-site/off-site personnel and any subcontractors.

- Delineate training and equipment requirements necessary for the performance of expected tasks and ensure that training is completed and equipment is available.

- Delineate air monitoring requirements necessary during sampling activities to revise specific protection levels as required.

- Protect the general public and the environment.

The H&S Plan will be reviewed and approved by EPA before commencement of on- or off-site sampling activities.

Task 6 - Development of Quality Assurance Project Plan and Sampling Plans (15-20 days)

A Quality Assurance Project Plan (QAPP) will be developed by Montrose Chemical Co in accordance with EPA guidance documents. The QAPP will be developed for the Montrose Facility site work to ensure that all data generated are scientifically valid, defensible, comparible, and of known precision and accuracy and

will require approval by EPA prior to initiating site work. It will address standards and/or criteria for the following site-related operations: selection of monitoring well drilling methods, equipment and materials; topographic surveying; aerial photography and ground control points; calibration and operation of field equipment, and other field sampling activities.

The QAPP will address, as a minimum:

- Field sampling procedures
- Methods for preventing sample cross-contamination
- Field bias blanks, splits, and duplicates
- Use of field data sheets to document dates, start and stop times, locations, meteorological conditions, problems experienced and corrective actions taken, and calibration of field instruments.
- Other in-field documentation requirements, including photography
- Preservation, packing, shipping, and handling procedures
- Sample tags and chain-of-custody sheets for all samples
- Analytical methods
- Sample calculations for all data reduction
- Calibration procedures
- QC checks on reagents
- Internal and external audits

Sampling plans for each type of field investigation, e.g., soil, water, and air sampling will be developed covering:

- Objectives
- Background information, including conditions that may affect sampling and expected sources, pathways, and concentrations.
- Selection of analytical parameters and other measurements, with justification, preservation and handling techniques, number and type of containers, and analytical methods.
- Selection of sample type, location, and frequency; with justification
- Field protocols, including qualifications of sampling personnel, documentation procedures (including chain of custody), sampling logistics and schedule, decontamination procedures, shipping, and sampling methods.
- Quality assurance.

Where appropriate, the Sampling Plans may incorporate procedures already specified in the QAPP by reference, with any modifications noted.

Since the field investigations are phased, with scope of the second part dependent on results of the first part, Sampling Plans will be prepared at several times during the RI. Sampling Plans for Part 1 Tasks 11-13 (Onsite Soil and Part 1 Hydrogeology and Groundwater Sampling) will be submitted with the QAPP. Sampling Plans for the Part 2 Tasks 13-15 (Onsite Soil; the

Offsite Soil, Sediment, and Surface Water; and the Air Sampling) will be prepared after EPA acceptance of the Part 1 results. EPA approval of all Sampling Plans is required prior to initiation of sampling activity.

Task 7 - Mobilization of Field Equipment (Part 1: 10 days, Part 2: 5 days)

The equipment needed during the remedial investigation will be mobilized by Montrose Chemical Co. The following equipment may be needed at the Montrose Facility Site during the remedial investigation:

- Field office trailer
- Groundwater monitoring well installation equipment
- Air sampling equipment
- Groundwater, surface water, soil, sediment and waste sampling tools and equipment
- Health and safety equipment
- Decontamination equipment.

Task 8 - Acquisition of Permits, Right of Entry and Other Authorizations (10 days - 3 months)

Montrose Chemical Co. will obtain all permits necessary to conduct sampling and will obtain written permission to sample offsite areas from all present property owners and tenants identified in Task 4.

The following agencies will be contacted to determine permit requirements:

- South Coast Air Quality Management District
- Los Angeles Regional Water Quality Control Board
- Los Angeles County Flood Control District
- Los Angeles County Health Department
- City of Torrance
- Port of Los Angeles

- U.S. Army Corps of Engineers

Access to property will be needed from the following:

- Southern Pacific Railroad
- Los Angeles Department of Water and Power
- Farmer Brothers Coffee Co.
- Los Angeles County Flood Control District
- City of Los Angeles Bureau of Sanitation
- Residential property owners
- Others identified in sampling plans

Locations of all underground utilities (gas, water, sewer, telephone, power) will be identified and appropriate permission obtained where sampling is required within utility easements.

Task 9 - Performance of Community Relations Support Functions (ongoing)

Community relations support will be provided by EPA to include the development and implementation of a Community Relations Plan (CRP) logistic support for the planning and execution of the activities for the Montrose Facility Site and technical support to ensure that all distributed information is accurate and current.

The CRP will include a brief site description and chronology of site and community relations activities; identify key community issues and concerns; define objectives and techniques of the community relations program; identify community relations milestones such as public meetings, written communications, 2-week public notification periods, and 3-week public comment periods; and include a mailing list of interested parties.

Identifiable milestones for fact sheet distribution and, in some cases, public meetings, through completion of the Feasibility Study (FS) phase will probably include:

1. Final RI/FS Work Plan

2. Results of Part 1 On-Site Soil Sampling and List of Target Chemicals

3. Results of Complete RI

4. Completion of FS

5. Enforcement Record of Decision (ROD)

REMEDIAL INVESTIGATION - SITE ACTIVITIES

The purpose of Site Remedial Investigation Activities is to gather site-specific information concerning the type and extent of contamination so that appropriate remedial responses can be identified and evaluated during the subsequent feasibility study.

A total of nine tasks comprise the Site Remedial Investigation Activities. Tasks 10 through 17 will be completed by Montrose Chemical Co. under EPA oversight as described in Task 18.

Task 10 - Performance of Site Mapping Including a Property Survey and Topographic Survey (20 days)

A property survey will be conducted by a qualified surveyor to delineate and verify certain property lines of all properties adjacent to the site and also the Farmer Brothers Coffee Co. property. These property lines will be identified in the field and on a Site Base Map and will be used in gaining access and right of entry for any subsequent subsurface investigations and/or monitoring purposes. A topographic survey will also be conducted in preparation of the Site Base Map. The Site Base Map will be used during the remedial investigation and implementation of remedial actions and for determining the horizontal and vertical locations of existing and proposed groundwater monitoring wells. The existing site topographic Map (reproduced in the M&E report, November 1983) is no longer valid as a result of site grading conducted by Montrose Chemical Co.

A field survey crew will delineate and mark property lines in the field and on the Site Base Map. These can be determined by reviewing the product of Task 4 (Title Search) and/or examination of existing property records at the local courthouse and local tax assessment maps.

Site topography will be mapped using aerial photography with ground control. Horizontal and vertical ground control will be established as required by the aerial photography requirements. Field crews will establish and construct points which will be visible on the aerial photographs. A permanent benchmark for horizontal and vertical control will be established and tied to USGS mean sea level (MSL) datum.

The site will be flown, in suitable weather and visibility. Specific flight parameters such as speed, number of flight lines, photographic exposure interval, and flight altitude will be controlled by the photogrammetrist to provide for a proper and completely finished topographic map covering an area including the Montrose Facility site and all areas within 500 feet of the delineated site boundaries.

The topographic site base map will be a single, scribed, double matte, 3-mil washoff mylar with reversed image. The map will have a horizontal scale of 1 inch = 100 feet and a contour interval of one foot. One off-site and four on-site temporary benchmarks should be established and located on the Site Base Map. A 200-foot square coordinate grid will be overlain on the map oriented to state coordinate system labeled with corresponding reference numbers and letters to allow easy identification of portions of the property and sample locations. Each 200-foot grid square will be subdivided into four equal-area quadrants. The grid will cover the entire mapped area, not just within the site boundaries.

Additional mylar base maps will be prepared for the other off-site sampling areas, when these are defined. Airphotos or existing maps by the U.S. Geological Survey or other agencies may be used where appropriate. Scale will be chosen such that sample locations can be accurately defined.

All utilities and abutting property owners will be contacted to determine location, size, nature, and materials of underground piping, drains, catchbasins and other structures. These will be shown in plan view on the Site Base Map and, where necessary, in cross-section. This information will be used to (1) prevent unnecessary damage during soil sampling and well installation and (2) assess technical feasibility and cost of various alternative remedial actions. It is possible that some nonintrusive geophysical techniques, such as magnetometers or ground penetrating radar, may be necessary to adequately define subsurface structures and utilities.

Following the installation of groundwater monitoring wells, all wells will be surveyed and elevations will be established with respect to the temporary benchmarks (datum MSL) and drawn onto the Site Base Map. These elevations and locations are necessary to determine the hydrogeologic conditions beneath the site.

Task 11 - Performance of Hydrogeologic Investigation (40 days)

The Montrose Facility Site is located on the coastal plain in a groundwater basin known as the west plain (Poland, Garrett, and Sinnott, 1959) or the west coast basin (State of California Department of Water Resources, 1961). The basin consists of a series of aquifers which are listed below as they reportedly occur in the vicinity of the site.

Formation names	Aquifer names	Approximate aquifer elevation (datum MSL)
Lakewood Formation (Terrace Cover, Palos Verdes Sand, unnamed Upper Pleistocene deposits)	"Semi-perched" aquifer	-30 to ?
	Gage aquifer (200-ft sand)	-80 to -130
San Pedros Formation	Lynwood aquifer (400-ft gravel)	-200 to -325
	Silverado aquifer	-450 to -650

No water level data is available for the site itself, but the log for the Jones Chemical Co. well (LACFCD No. 795), which is within several hundred feet of the Montrose site, indicates that water was "struck" at a depth of 71 feet. Dry sand was logged from depths of 53 to 71 feet, underlain by yellow clay at depths from 71 to 102 feet. This well is reported to be perforated in the Silverado aquifer.

Two wells that are reported to be perforated in the Gage aquifer (LACFCD Nos. 785c and 806C) are located about one mile southwest and south of the site, respectively. The water level elevations in those wells in 1978 were -31 feet and -38 feet (MSL). All of these water level data suggest that the main water at the site occurs at a depth of about 70 feet and may be located in the "semi-perched" aquifer. The exact depth of the borings and the wells will be determined in the field during the investigation.

The hydrogeological investigation may require two or more parts. The objective of Part 1 is to determine if contaminants from the Montrose site have moved down through the unsaturated zone to the groundwater system. A summary of the sampling requirements of Part 1 is shown in Table 2. When Part 1 of this task and Task 12 (Groundwater Sampling) have been completed, a preliminary Hydrogeologic Report will be prepared for EPA review.

If it is determined in the Part 1 investigation that chemicals originating at the Montrose Facility site are migrating to groundwater, a Sampling Plan for a Part 2 Hydrogeologic Investigation will be developed, with the objectives of defining vertical and horizontal extent of groundwater contamination; the rate and direction of groundwater flow; and developing sufficient data to assess public health and environmental risks, evaluate technical feasibility, and estimate costs of alternative remedial actions.

Table 2. HYDROGEOLOGIC INVESTIGATION - SAMPLING REQUIREMENTS
Five Wells, Screened Below Main Water Table

Sample collection

Sample type	Sampling technique	Sampling interval	Depth, ft	Field analysis
Soil	Split-spoon or Shelby tube	Continuous	0-30	OVA
Soil	Split spoon or Shelby tube	5 ft	30 to bottom of boring	OVA

Laboratory analyses of selected soil samples

Selection criteria	Analyses
All samples with OVA above background	EPA Priority Pollutant
One sample of each saturated stratum per boring or every 15 feet.	EPA Priority Pollutant

Water level measurement

- Four weekly water level measurements in all five wells - Preliminary Report
- Monthly measurements in all wells until ROD complete

Hydrogeologic Investigation-Part 1. To determine if chemicals have migrated from the Montrose site to the groundwater system, soil and groundwater below the main water table and any perched water bodies that may exist above it will be evaluated. The evaluation should be made in the context of an area-wide description, based on available information, of groundwater movement in the principal aquifers that underlie the site and their hydraulic properties and degree of hydraulic interconnection.

The drilling program and the subsequent construction of monitoring wells will be done (1) to provide hydrogeologic data

regarding the movement of water in the unsaturated and saturated zones and 2) to provide soil and groundwater samples for chemical analysis. Five on-site borings, all of which will be converted to wells, will be drilled to an estimated depth of 70 to 100 feet, as shown in Figure 4. Prior to initiation of field sampling, the Part 1 Sampling Plan will be prepared by Montrose Chemical Co. and reviewed and approved by EPA.

Either large-diameter hollow stem augers or air rotary drilling techniques will be used to advance the boreholes. The drilling method will be selected after discussions with local drilling contractors have been held to determine their capabilities and equipment and will be included in the QAPP and Sampling Plan (Task 6) for EPA approval. One of the critical aspects of the drilling operations is preventing the downward movement of contaminated surface soil during drilling or monitoring well construction. The use of a 10- to 20-foot length of large diameter casing at the surface, and steam cleaning of the drill stem and bit after penetrating the upper soils, is a possible method of mitigating this potential problem.

Split spoon samples will be taken continuously from the ground surface to a depth of 30 feet, and at five-foot intervals thereafter. Borings will be logged by a qualified geologist or geotechnical engineer. Field observations to be recorded include visual soil classifications, color, moisture content, presence of foreign materials, sample recovery, and any problems encountered while drilling or sampling.

All samples will be collected, handled, preserved, and stored for analysis according to criteria specified in Task 13 (On-Site Soil Sampling) and in the QAPP and Sampling Plans developed under Task 6. Portable organic vapor analysis equipment will be used to scan all soil samples in the field as they are collected. Any soil samples that give a positive OVA indication above background levels will be analyzed for all EPA Priority Pollutants. In addition, in all five borings, one soil sample for each stratum

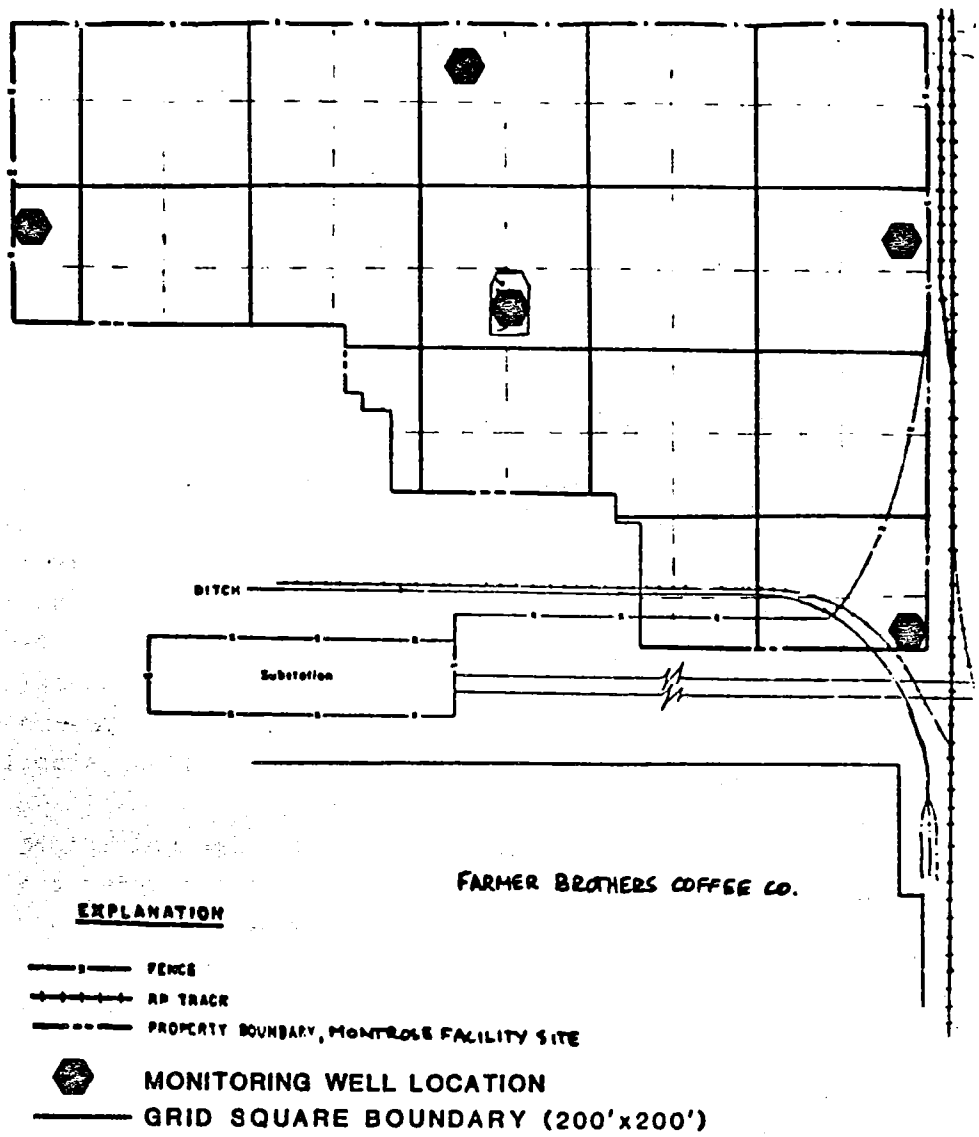


FIGURE 4. ON-SITE MONITORING WELL LOCATIONS
MONTROSE FACILITY SITE

that is saturated will be designated for analysis of all Priority Pollutants. Any samples which visually appear to show characteristics of contaminated soil will also be analyzed for all EPA Priority Pollutants.

Monitoring well screens and riser pipe will be a 2-inch minimum nominal diameter and constructed of Schedule 80 PVC. Well screens will be 5 or 10 feet long, and sections of pipe will have threaded connections. The location of the screened intervals will be determined during the drilling program.

Screens and riser pipes will be installed in the completed boreholes, and the annular space around the well screens will be backfilled with clean, coarse sand to 2 feet above the top of the well screen. A layer of bentonite pellets 5 feet thick will be placed above the sand pack. The annulus between the well and the borehole wall above the bentonite seal will be filled with cement and bentonite grout. The grout will be placed with a tremie pipe just above the top of the bentonite layer. The grout will be pumped through this pipe to the bottom of the annulus until undiluted grout flows from the hole at the ground surface. A protective, lockable steel casing will be placed over each monitoring well and grouted in place.

The monitoring wells will be developed to remove the fine-grained aquifer materials from the vicinity of the well screen so that clear water samples can be collected. Monitoring well construction and development will comply with requirements of the California Regional WQCB, Los Angeles Region (Underground Tank Investigation Program, November 1983).

After well development has been completed, a series of four weekly water level measurements will be taken; these will be included in the Part 1 Hydrogeologic Investigation Report described below. Thereafter, monthly water level measurements will be taken and results submitted to EPA until the Record of Decision has been completed. Water level elevations will be referenced to mean sea

level based on survey data developed in Task 10. Groundwater flow direction will be evaluated.

Within 30 days after completion of Part 1 of Tasks 11 and 12, a preliminary report of the hydrogeologic investigation will be submitted to EPA. The report will contain boring logs of the 5 on-site wells, details of well construction and development, water level elevations and water table map, the results of chemical analyses of groundwater (Task 12) and soil, and a summary of hydrologic information obtained in Task 3, including recent regional water table and potentiometric maps. These results will be reviewed in conjunction with results of Part 1 of the On-Site Soil Sampling (Task 13), and a determination made as to whether chemicals migrating from the Montrose Facility Site appear to have reached the groundwater system. If this is the case, additional information will be needed to evaluate the necessity for remedial action, and a Sampling Plan for Hydrogeologic Investigation-Part 2 will be prepared in accordance with the objectives below.

(If Necessary) Hydrogeologic Investigation - Part 2. If contaminants from the Montrose site are identified in any of the monitoring wells, then additional investigation(s) will be carried out to determine the flow path of the contaminants and the potential receptors. The objectives of these investigations will be to determine the vertical and lateral extent of contamination and to define the regional flow system and direction and rate of contaminant migration. The required tasks will include an inventory of existing wells within a three-mile radius of the site and sampling of existing on- and off-site wells in the "semi-perched" and the Gage aquifers as well as aquifer testing. Chemical analyses will be performed only for target chemicals (determined in Task 13) and other constituents necessary to evaluate the groundwater flow pathways and receptors.

Task 12 - Groundwater Sampling (5 days)

Groundwater monitoring wells (constructed under Task 11) will be sampled. Prior to collecting the sample, three static well casing volumes of water will be pumped from each well. The purged water will be collected in drums, analyzed for priority pollutants to determine appropriate disposal methods, and disposed of in accordance with state and local regulations. Sample collection, handling, preservation, labeling, and chain-of-custody procedures established in the QAPP and Sampling Plans will be followed. Groundwater samples will be collected during Part 1 from the five on-site wells and all other wells identified in Task 3 within a 1-mile radius of the site, as shown in Table 3. Any off-site well not equipped with an operational pump will require purging three static well casing volumes of water before samples are collected. Prior to sampling each off-site well, the elevation of the perforated zone will be determined and included in the preliminary report.

Table 3. TASK 12 - MINIMUM GROUNDWATER SAMPLING AND ANALYSES REQUIREMENTS

Sample type	Location	Aquifer	No. samples	Analyses
Groundwater	Onsite	"Semi-perched"	5	Complete Priority Pollutant
Groundwater	Offsite	All	Min. 3[a]	Complete Priority Pollutant

a. All wells identified in Task 3 within a 1-mile radius will be sampled.

Task 13 - On-site Soil and Waste Pile Sampling (Part 1: 30 days, Part 2: 30 days)

Soil sampling on-site performed by Montrose in 1983 has shown DDT concentrations up to 95,000 ppm (9.5 percent). Total DDT has been identified in concentrations exceeding the California Total Threshold Limiting Concentration (1 mg/kg) at depths greater than 5 feet. In the western portion of the site, where the highest DDT levels were found, foreign materials were noted in the boring logs: yellow and white streaks, black granules, and gels or greases. Since the 1983 on-site sampling was performed,

extensive earthwork has been done on-site, so the existing sampling data is no longer a valid indication of the location and extent of contaminated soils.

Chemicals other than DDT have reportedly been used and/or manufactured at the site, e.g., monochlorobenzene, sulfonic acid, chloral and others. DDT-contaminated materials have been sprayed for dust control by a hydrocarbon or asphaltic preparation. Data is needed to determine the existence and extent of other chemical contamination, which also may impact the migration of DDT by causing desorption or solubilization.

A two-part soil sampling program will be conducted, as summarized in Table 4. The objective of Part 1 is to identify chemical contaminants and to determine the maximum depth of soil contamination of the site. Results of this program will be evaluated by EPA to target specific chemicals for more detailed analysis. The List of Target Chemicals, as approved by EPA, will form the basis for all further sampling (soil, water, air). The objective of Part 2 is to define the areal and vertical extent of the targeted compounds and other physical/chemical parameters necessary to perform the Feasibility Study (technical evaluation, assess public health and environmental risks, and estimate costs of alternative remedial actions).

Prior to initiating soil sampling, Sampling Plans will be prepared by Montrose Chemical Co., and reviewed and approved by EPA. The following considerations should be included in the On-Site Soil Sampling Plan. Figure 5 shows the grid to be used to identify sample locations for both parts of the on-site soil sampling program. The site has been divided into grid squares measuring 200 feet on a side, with each grid square divided into four equal-area quadrants. The grid numbering system established in Task 10 will be used throughout the RI to designate sample locations.

Table 4. TASK 12 - ON-SITE SOIL SAMPLING REQUIREMENTS

Sample type		Depth	Total No.	Analyses
Part 1 Investigation				
In situ -	Soil	0-1 in.	18	PP[a], TOC[b]
	Soil	2 ft	18	PP, TOC
	Soil	4 ft	18	PP, TOC
	Soil	6 ft	18	PP, TOC
	Soil	8 ft	18	PP, TOC
	Soil	10 ft	18	PP, TOC
Each major soil type		N.A.	1	Grain size[d] plus PP
Piles -	Crushed concrete	0-1 in.	-[c]	PP
	Crushed concrete	3 ft	-[c]	PP
	Crushed concrete	5 ft	-[c]	PP
	Crushed concrete	3.ft	1	Grain size[d] plus PP
	Soil/debris	0-1 in.	3[c]	PP
	Soil/debris	3 ft	3[c]	PP
	Soil/debris	5 ft	3[c]	PP
Part 2 Investigation				
In situ -	Soil	0-1 in.	48	Target compounds
	Soil	1 ft	max 48[e]	Target compounds
	Soil	2 ft	max 48[e]	Target compounds
	Soil	3 ft	max 48[e]	Target compounds
	Soil	4 ft	max 48[e]	Target compounds
	Soil	5 ft	max 48[e]	Target compounds

a. PP = EPA priority pollutants.
b. TOC = total organic carbon.
c. One sample per 200 cubic yards above grade.
d. Separate Priority Pollutant analysis on each size fraction.
e. Part 2 samples will be at 1-ft intervals. Maximum depth will be determined by EPA based on Part 1 results; maximum depth may vary from grid square to grid square.

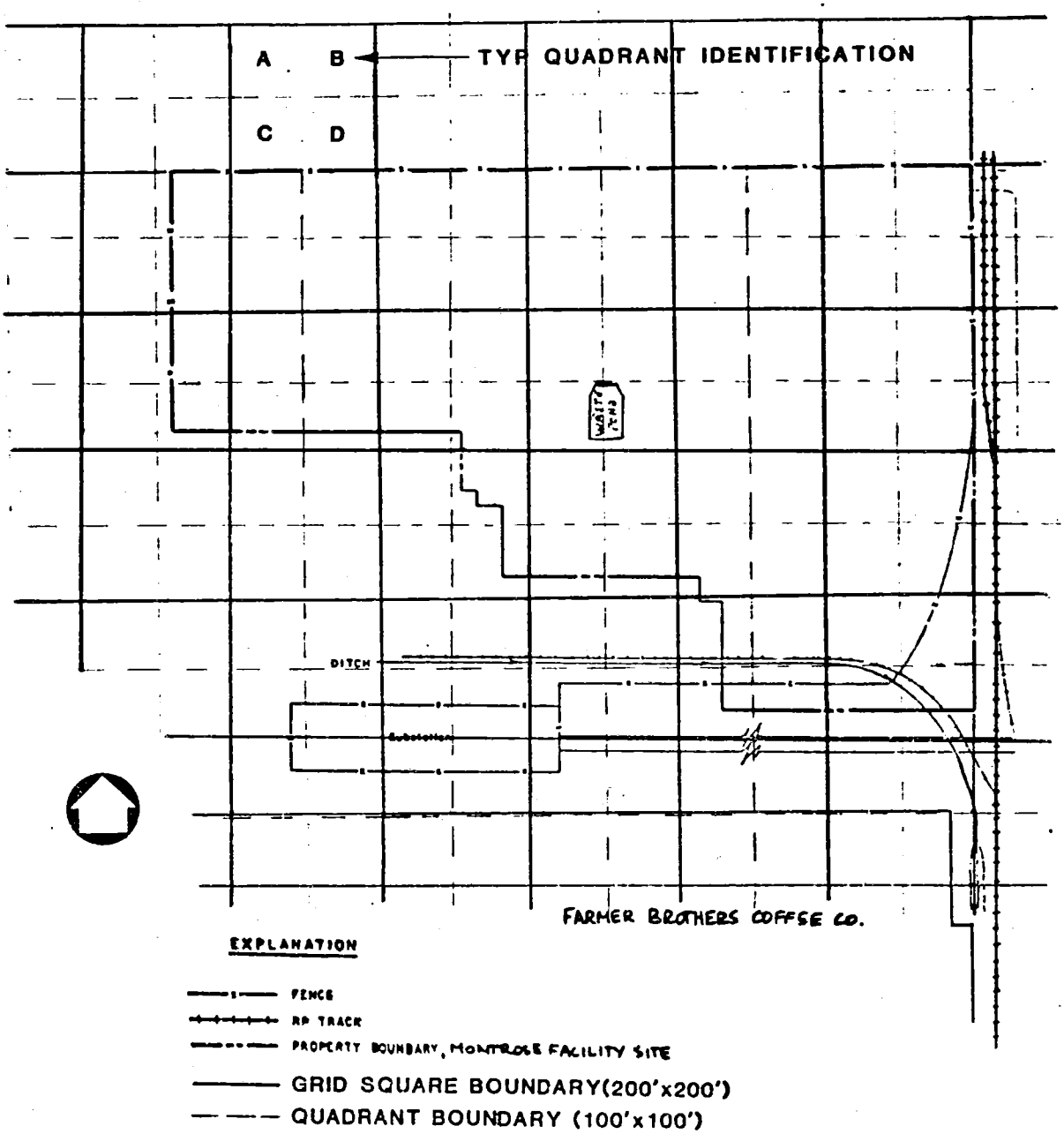


FIGURE 5. ON SITE SOIL SAMPLING GRID
MONTROSE FACILITY SITE

At each designated sample location, continuous soil samples will be taken and logged by a qualified geologist or engineer. Field observations to be recorded include visual soil classification; color; moisture, the presence of foreign materials such as debris, gels, grease, or granules; sample recovery; OVA readings; and any difficulties with sampling. Sample collection and handling methods will be selected, after considering the following:

- Sufficient sample volume for analytical procedures including QA.
- Prevention of cross-contamination vertically within each boring and from boring to boring.
- Prevention of loss of volatile compounds during sample collection and storage prior to analysis.
- Proper selection of containers and preservation techniques.

Drilling with a hollow-stem auger, sample collection with split-tube drive samplers lined with brass tubes sealed with no headspace and immediately chilled to 4°C, and use of a field steam cleaner to clean tubes, samplers and augers will satisfy these concerns.

On-Site Soil Sampling - Part 1. One boring will be made in the center of each on-site quadrant B or partial quadrant B, with samples designated for analysis at stratum changes and at the following six depths for analysis: ground surface, 2 ft, 4 ft, 6 ft, 8 ft, and 10 ft.

Where distinct layers of different colors or textures are present, separate samples will be taken and analyzed. For instance, where a brown sandy clay contains yellow and white streaks, three separate samples should be analyzed: one of the brown sandy clay, one of the white material alone, and one of the yellow material alone.

In addition, a boring will be made in the center of any on-site pond or lagoon identified in plant records or in the aerial photograph review (Task 3). Samples will be collected and analyzed at 2-foot intervals to a depth of 10 feet below the original pond bottom or to a depth of 20 feet below the present ground surface, whichever is greater.

Because of DDT's low solubility, most of the DDT transported via surface water will be in the solid (rather than liquid) phase, either as particulate DDT or sorbed onto soil particles. No site-specific data is available on the solid-liquid phase partitioning of DDT in stormwater runoff or on the relationship between grain-size and DDT concentration or the presence of other chemicals that may affect DDT's mobility. It is necessary to determine this relationship to predict the potential off-site movement of DDT via surface water and possible aerial redistribution of dry soils or sediments.

All Part 1 soil samples will be analyzed for priority pollutants and total organic carbon, according to standard EPA protocols. In addition, to predict migration characteristics of the chemicals found (via sediment in surface water or aerial transport), it is necessary to determine the chemical concentrations associated with each particle size. To this end, one sample of each soil type encountered at the site will have complete grain-size determinations made, with separate chemical analyses of several different size fractions of each of these samples, in accordance with procedures to be included in the QAPP and Sampling Plans. The samples chosen for grain size analysis will contain the highest concentrations of chemicals found in that soil type. The size fractions chosen will be the same as those analyzed under Task 14.

Within 30 days after completion of the Part 1 analyses, a complete report will be prepared for review by EPA. The report

will contain results of chemical and grain-size analyses; boring logs and significant field observations; a site map showing all measured DDT concentrations; one or more site maps showing concentrations of other priority pollutants that exceed state or federal hazardous waste criteria; and proposed Part 2 sample depths and chemical parameters (List of Target Chemicals). Upon EPA acceptance of these results, the Sampling Plan for Part 2 will be finalized, specifying number, locations, and depths of soil samples and analyses to be performed (this effort is included in Task 6).

Aggregate and Debris Pile Sampling. Several piles of debris and crushed concrete exist on the site. Volumes of each pile will be measured and samples analyzed for all priority pollutants according to the Part 1 soil protocols. This work may be done concurrently with Part 1 soil sampling. One sample per 200 cubic yards of crushed concrete material and a minimum of 9 samples from other onsite piles will be analyzed, distributed as shown in the preceding Table 4.

Grain-size analyses will be performed on a total of one representative crushed concrete sample. Separate chemical analyses for priority pollutants will then be performed on each size fraction of this sample.

Part 2 On-Site Soil Sampling. One boring will be made in the center of each quadrant or partial quandrant A, C, and D, with samples collected at the following depths for analysis: ground surface, 1 ft, 2 ft, 3 ft, 4 ft, and 5 ft. These depths may be adjusted, with EPA concurrence, based on information obtained in Part 1. Soil samples will be analyzed for the List of Target Chemicals developed based on Part 1 results.

Task 14 - Off-Site Soil, Sediment and Surface Water Sampling [60 days]

After the Part 1 on-site soil and hydrogeologic investigations have been completed and the List of Target Chemicals has been determined by EPA, Sampling Plans for evaluation of off-site migration of those chemicals will be produced and implemented, according to the criteria established below. Programs will be undertaken to sample off-site soils, sediment in sewers and storm drains, and surface water. The off-site soil sampling can be done in conjunction with the Part 2 on-site soil sampling; the sediment and surface water sampling can be done at any time after completion of Tasks 1-10 and the List of Target Chemicals. Tables 5, 6, and 7 summarize sampling requirements for this task.

Off-Site Soil Sampling. Off-site sampling by EPA and Montrose Chemical Co. in 1982 and 1983 has shown DDT concentrations in soils as high as 2,400 ppm in drainage paths where stormwater runoff leaves the Montrose Facility Site. Further definition of the nature and extent of contamination will be necessary to assess technical feasibility, public health and environmental risks, and costs of the alternative remedial actions.

Table 5. TASK 14 - OFFSITE SOIL REQUIREMENTS

Sample location	Sampling interval		Maximum depth	No. of Analyses	
	Horizontal	Vertical		Target chemical	Grain size plus target chemical[a]
Existing drainage areas	10,000 sq ft	1 ft	5 ft	612[b]	1
Site perimeter	200 lin. ft	1 ft	5 ft	96[b]	0
Neighborhood	—[c]	1 ft	3 ft	—[c]	1
Former drainage paths	—[c]	1 ft	5 ft	—[c]	1

a. Separate chemical analyses for each size fraction.

b. May be adjusted for some locations based on Task 13 results.

c. To be determined based on Task 2 and 3 results.

Table 6. OFFSITE SEDIMENT SAMPLING REQUIREMENTS

Sample type	Sample location(s)	No. of analyses: target chemical	No. of analyses: Grain size plus target chemical[a]
Sanitary sewer	Manholes (Montrose to treatment plant)	—[b]	1
Stormdrain	Manholes (Montrose to Torrance Lateral)	—[b]	1
Dominguez Channel[d]	Upstream[c]	2	1
Dominguez Channel[d]	Downstream[c]	3	1
Consolidated Slip[d]	—[b]	10	1

a. Separate chemical analyses on each size fraction.
b. To be determined based on Task 2 and 3 results.
c. With respect to stormwater flowpath from Montrose.
d. Dominguez Channel and Consolidated Slip sediment sampling to be collected during one stormwater sampling episode (Table 7).

Table 7. SURFACE WATER SAMPLING REQUIREMENTS[a]

Sample type	Sample location(s)	No. samples per episode	No. of episodes: Dry season	No. of episodes: Rainfall >0.20 in.	No. of episodes: Rainfall >0.75 in.
Stormwater runoff	Montrose to mouth of Torrance Lateral	10	0	5	1
Dominguez Channel	Upstream	2	1	2	0
Dominguez Channel	Downstream	3	1	2	0

a. All samples to be analyzed for target chemicals on filtered and unfiltered samples.

An Off-Site Sampling Plan will be produced for EPA approval based on results of the Part 1 On-Site Soil Sampling and the list of Target Chemicals. Based on historical air photos and hydrologic data, and existing topography, all drainage areas which appear to have received runoff from the Montrose property will be identified. One known pathway to the Los Angeles Harbor is shown in Figure 6. The offsite soil sampling will include those drainage areas on a 100-ft grid, and a single line of perimeter samples spaced 200-ft apart. Sufficient samples must be taken outside the identified drainage area and to sufficient depth to define the extent of contamination resulting from surface water runoff and infiltration. Sample locations shown in Figure 7 may be adjusted, with EPA approval, in accordance with the above criteria.

One soil boring will be made at each sample location. Soil samples will be collected continuously according to procedures specified in Task 13 and the QAPP and Sampling Plans. Soil samples will be designated for analyses at 1-foot depth intervals to a depth specified in the Off-Site Sampling Plan. Sample collection, handling, preservation, and analytical procedures will follow standard EPA and/or State protocols for the target chemicals.

Additional soil sampling is required to help characterize potential exposures to offsite populations from previous airborne release of DDT from the Montrose facility. Limited soil sampling conducted in the neighborhood (204th Street) near the site suggests variable contamination by DDT. The purpose of the additional sampling proposed here is to better characterize levels of DDT in surface soils surrounding the site, in particular those residential areas north, southwest, and southeast from the site.

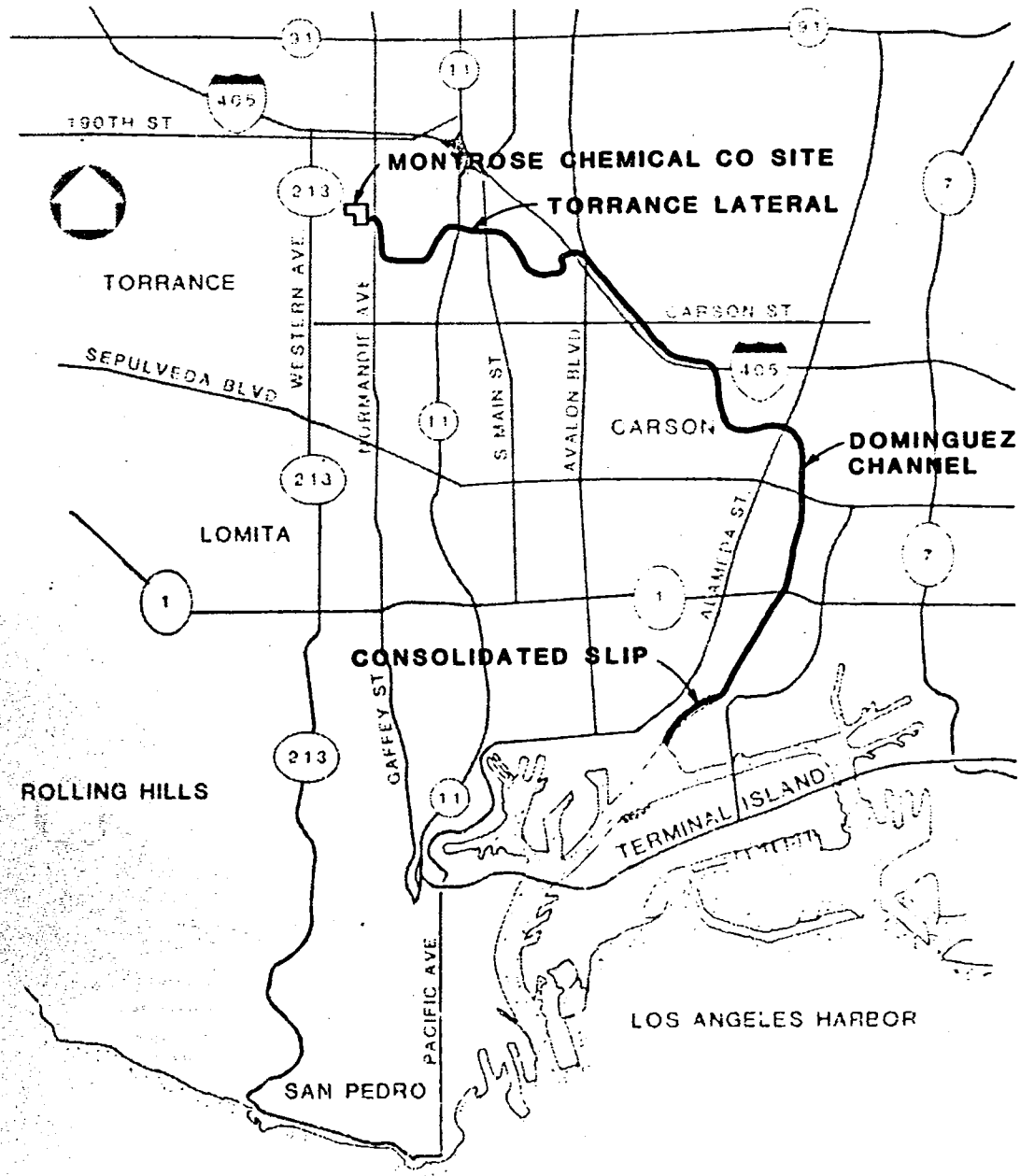


FIGURE 6. EXISTING STORMWATER FLOW PATH FROM MONTROSE

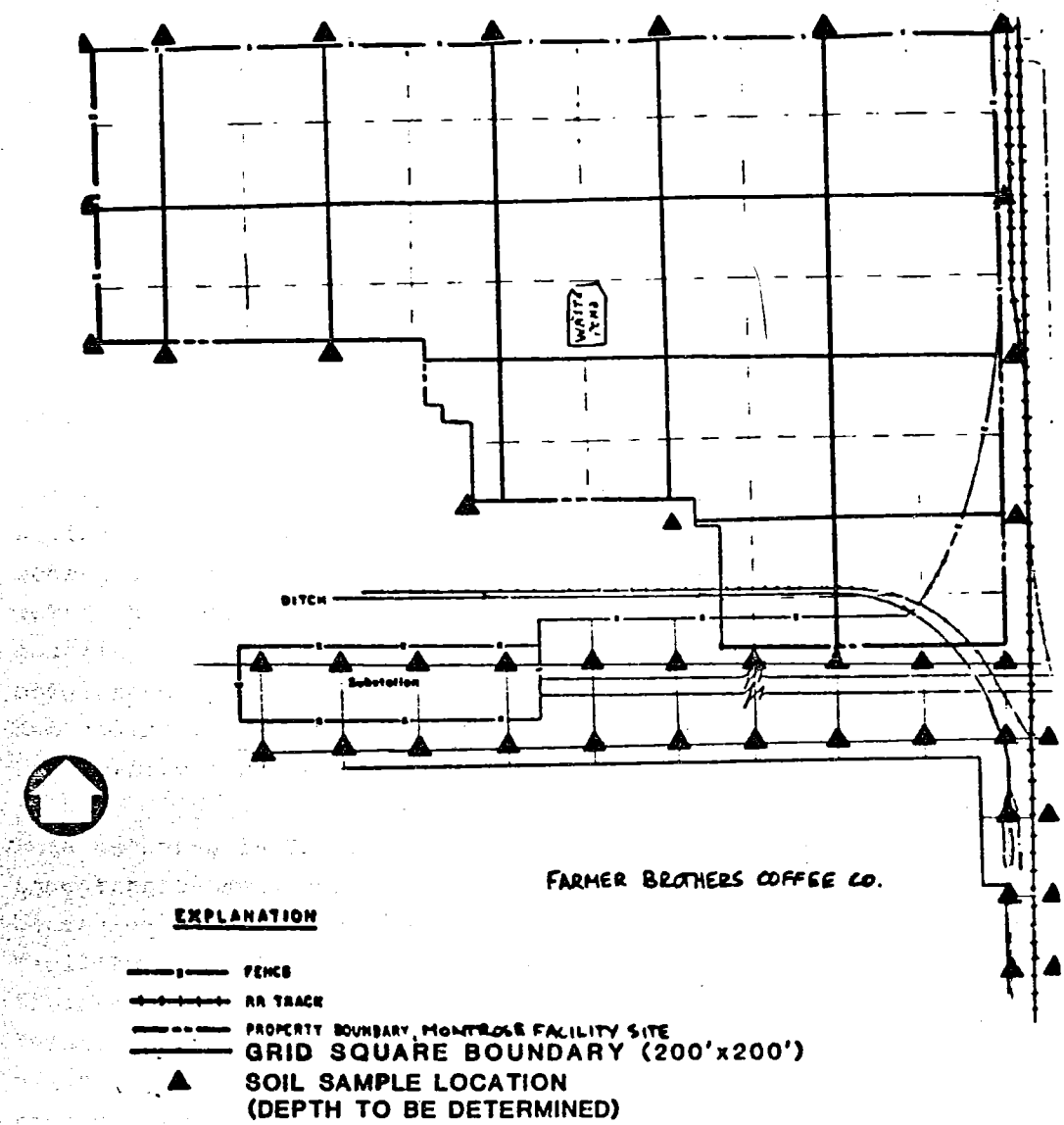


FIGURE 7. OFF-SITE SOIL SAMPLE LOCATIONS
MONTROSE FACILITY SITE

An initial neighborhood sampling program will be conducted first to determine the need for more extensive offsite soil sampling. The initial program will be established in conjunction with the results of Task 15 - Air Sampling. At a minimum, it should involve sampling soil at equidistant locations along the perimeter of a circle drawn around the site. The radius of the circle should be selected to allow sampling in nearby neighborhoods and schoolyards. The exact number of samples will be determined after assessment of existing soil sampling data and the results of Task 15 - Air Sampling. Soil samples should be collected from the top 2 to 3 inches of soil (0-3 inches). Analyses will be done for Target Chemicals.

Surface Water and Sediment Sampling. DDT has been measured in sediments immediately offsite, in sanitary sewers, and in the Dominguez Channel and L.A. Harbor. The objective of the surface water and sediment sampling program in Task 14 is to define the quantity and location of contaminated off-site sediment that originated from the Montrose Facility Site, and determine flow and sediment transport characteristics for use in technical feasibility and environmental and public health assessments.

Data gathered in Tasks 2 and 3, historical aerial photographs and topographic maps, and topographic maps developed in Task 10 will be reviewed to define flow paths for stormwater from the Montrose Facility Site. Drainage areas that contribute flows that intersect the Montrose flow path(s) will also be identified. This is necessary to interpret sampling data and distinguish between background chemical concentrations and any contribution from the Montrose Facility site. Similarly, sanitary sewer flowpaths from the former Montrose facilities to the water pollution control facility will be identified, including major intersections. When this review has been completed and the target chemical list (Task 13) has been finalized, the Off-Site Sampling Plan will be prepared in accordance with the following.

Stormwater sediment samples will be collected from all manholes, catchbasins, and open storm channels along the flow path from the Montrose Facility Site to the Dominguez Channel. Background stormwater sediment samples will also be collected from one manhole or catchbasin on each flowpath that intersects the Montrose flowpath upstream of the Dominguez Channel. Sediment depth will be recorded at each location.

Sanitary sewer sediment samples will be collected from all manholes along the flowpath from Montrose to the treatment plant. Background sanitary sewer sediment samples will be collected from one manhole on each sewer that intersects the Montrose flowpath. Depth of sediment in the sewer pipeline will be recorded at each sample location.

Sediment samples will be collected in Consolidated Slip and upstream and downstream of the storm drain discharge into the Dominguez Channel. The number and location of samples in the channel must be selected on the basis of:

- Known or suspected presence of other major sources of DDT.
- Physical configurations in the channel where settling of sediments is more likely to occur.

At each sampling location, 5 separate sediment samples will be collected and composited for analysis so that one analysis is performed for each sample location. Sampling will be conducted with equipment that minimizes sample disturbance.

All sediment samples will be analyzed for the target chemicals established in Task 13, and complete grain-size analyses will be performed on selected representative samples as identified in Table 6. These representative samples will also have target chemical analyses done on several separate size fractions, to be

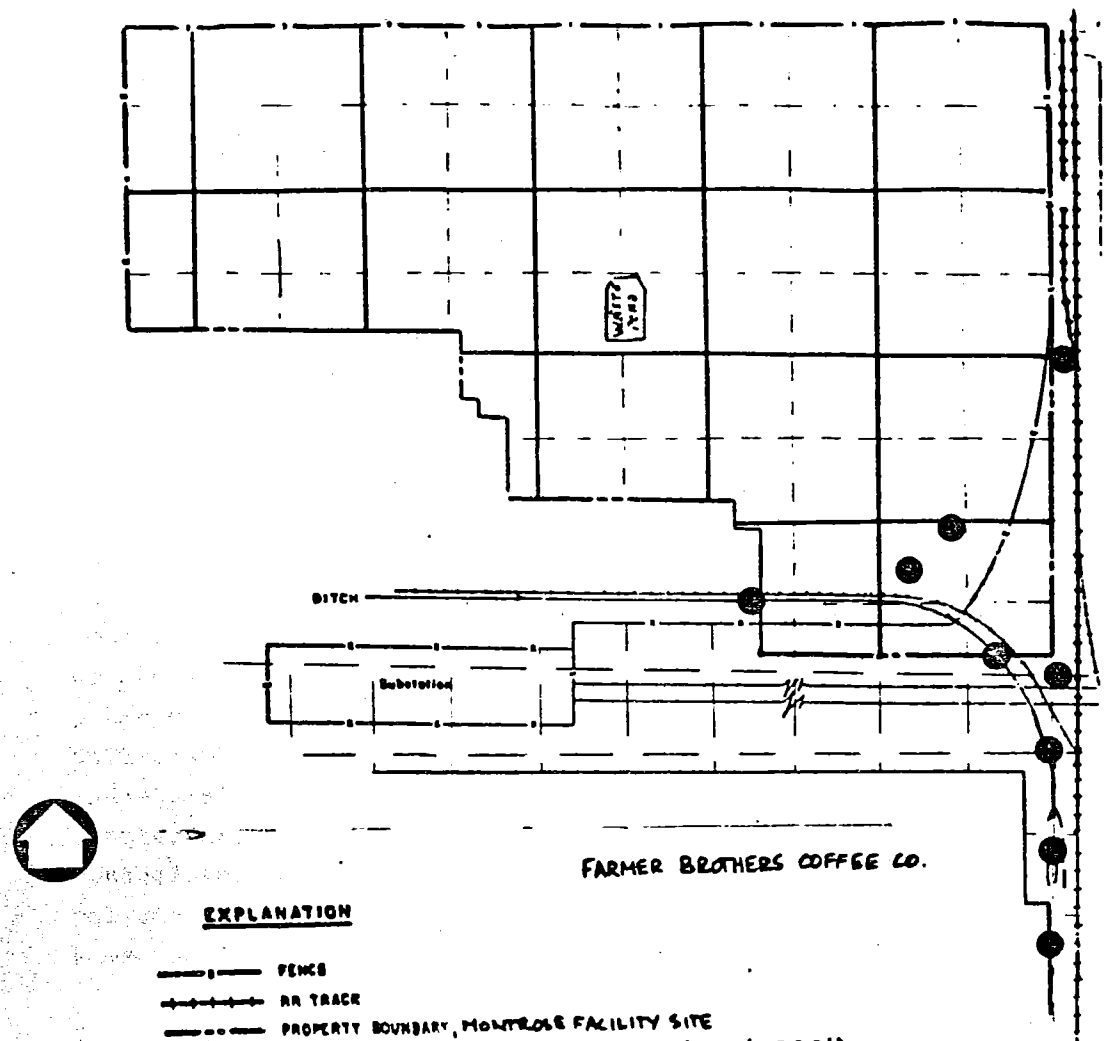
specified in advance in the Off-Site Sampling Plan based on hydrologic data already developed.

Surface water samples will be collected at or near the locations shown on Figure 8 for five consecutive eligible storms. Rainfall quantities shall be measured on site at hourly intervals during storm events. Eligible storms must have a total rainfall exceeding 0.20 inch. Six consecutive hours with less than 0.01 inch of rainfall shall mark the end of a storm. Surface water samples at these locations must also be collected for one storm exceeding 0.75 inch (this may be one of the five consecutive storms). At the time of sampling, flowrate will be determined for each sample location. Surface and sediment samples will be scheduled to provide for synoptic sampling.

Surface water samples will be analyzed for the target chemicals. Separate analyses for the target chemicals will be made for suspended solids (if present in sufficient quantity) and filtered water samples. Protocols to determine separate liquid and solid phase chemical concentrations will be included in the Offsite Sampling Plan.

In addition, water samples should be collected at each sediment sampling location in Consolidated Slip from 30% and 60% of total depth and composited in order to provide representative samples over the entire water column depth. Water samples should be collected at each sediment sampling location in the Dominguez Channel and at the same time as sediment samples are collected. Filtered and unfiltered samples should be analyzed to evaluate the levels of target chemicals in solution as opposed to those absorbed to suspended solids.

Water samples in Dominguez Channel and Consolidated Slip should be collected during both "dry" and "wet" conditions. Samples collected during "wet" conditions should be coordinated with other water sampling conducted during or after storm events.



NOTE: ONE ADDITIONAL SAMPLE LOCATION AT TORRANCE LATERAL DISCHARGE TO DOMINGUEZ CHANNEL.

FIGURE 8. STORMWATER RUNOFF SAMPLE LOCATIONS
MONTROSE FACILITY SITE

The sampling times (relative to the beginning of the storm event) must be selected to fall within the period during which runoff from the site is expected to occur to maximize the value of the data in assessing the impact of first flush runoff from the site.

Task 15 - Ambient Air Monitoring

To date there has been no air monitoring in conjunction with any investigation of the Montrose Facility site. The Southern California Coastal Water Research Project reports data on the flux of DDT in an aerial fallout study in 1973-1974*, however, no ambient air concentration data have been reported for this local area.

The objective of this task is to characterize the ambient air DDT contamination associated with the Montrose Facility site to contribute to preparation of an endangerment assessment (portion of the FS). Sampling and analyses will be conducted for DDT and other chemicals selected by EPA after reviewing the Part 1 Onsite Soil Sampling Results. Due to local automobile traffic and the industrial nature of the surrounding area (refineries, chemical manufacturers), significant background levels of organic contaminants can be expected. Also, the urban levels of criteria pollutants such as SO_2, NO_x, CO, or O_3 which may interfere with some sampling methods will be considered.

The basic approach will be a microscale upwind-downwind monitoring network. Appropriate sampling trains will be sited at preselected locations for three runs in a 2-week period. Minimum sampling requirements for this task are shown in Table 8; typical

*Young, David R. and D.J. McDermott. "Aerial Fallout of DDT." Coastal Water Research Project, Annual Report for the Year. As presented in EPA Region 9, Toxics and Waste Management Division Investigation Report. April 11, 1983.

sampling methods for other parameters are shown in Table 9. An onsite meteorological monitoring station shall be located near the center of the site. This station will monitor and record wind speed, wind direction, and ambient temperature for the 2-week monitoring period to assist in data evaluation and the sampling day selection process, and will include a rainfall gage to be monitored for the duration of the surface water sampling (Task 14).

Table 8. TASK 15 - MINIMUM AMBIENT AIR SAMPLING REQUIREMENTS

No. sample locations	Sample type	No. samples	Analyses required
7	Hi-volume	3 runs in 2 wk	DDT and Target Chemicals
7	To be determined	3 runs in 2 wk	Target Chemicals
1	Meteorological data	-	-

Specific elements of the Air Monitoring Program (Task 15) are outlined below:

1. Review neighborhood industrial processes to identify nearby processes or emissions that may influence the Montrose air monitoring.

2. Review List of Target Chemicals developed under Task 13 and, where appropriate, add parameters to the air sampling and analytical scope.

3. Evaluate site meteorology. Review of existing meteorological data is important in selection of monitoring locations. A licensed meteorologist will be consulted to assist in the prediction of such "average" days. The meteorologist will develop acceptability ranges for the predicted meteorological data that is

available one day prior to sampling. Actual sampling days will be selected by the meteorologist one day in advance.

4. Complete Air Sampling Plan and submit for EPA approval. Seven monitoring stations will be selected, given consideration to local obstructions, prevailing wind conditions, and access to private property. Local meterology indicates a predominance of 240° to 290° winds. At least one downwind station will be located within this range. Figure 9 illustrates one possible network, which includes seven offsite sample locations and one onsite meteorological station.

5. Calibrate all sampling equipment prior to any onsite monitoring. Depending on the final list of selected analytes, the calibrations will include at least hi-volume air samplers, field barometers, ambient thermometers, and possibly other sampling pumps or rotameters for any sampling trains in addition to the high volume particulate samplers for DDT.

6. Prepare monitoring locations for sampling. If offsite sample locations are used, permission must be obtained from property owners and arrangements made for security of sampling apparatus.

7. Conduct air sampling program. Analystical results will be submitted to EPA as soon as available; complete description of the program with meteorological data and description of any site activities conducted during the air sampling, will be included in the Remedial Investigation Report (Task 17).

Table 9. COMPARISON OF AMBIENT AIR SAMPLING METHODS

Collection media	Analytical parameters	Method references S, A	Flow rate (Lpm)	Duration of run	Type of sampler
1. Particulate filter (0.8u pore size, glass fiber filter)	TSP[a] Trace metals[b]	1, 1 1, 2	500-1,000	24 hrs.	Hi-volume air sampler
2. Particulate filter (0.3u pore size, glass fiber filter) with back-up PUF[c] sorbent cartridge	Pesticides Herbicides PNAs[d] PCBs[e] Trace metals[b]	3, 4 3, 4 3, 4 3, 4 3, 2	500-1,000	6-12 hrs.	Modified hi-volume air sampler
3. Tenax sorbent cartridge	VOCs[f] Solvents Halogenated hydrocarbons	4, 5 4, 5 4, 5	0.035-0.400	6-12 hrs.	Portable personnel sampling pump with tripod
4. Membrane filter cassette (0.8u pore size)	Trace metals[b]	6, 2	1.8	6-12 hrs.	Portable personnel sampling pump with tripod
5. PUF[c] sorbent cartridge with glass wool filter	Pesticides Herbicides PNAs[d] PCBs[e]	4, 4 4, 4 4, 4 4, 4	3-4	6-12 hrs.	Portable personnel sampling pump with tripod

[a]Total suspended particulate.

[b]Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, V, Zn (includes Hg).

[c]Polyurethane foam.

[d]Polynuclear aromatic hydrocarbons.

[e]Polychlorinated biphenyls.

[f]Volatile organic compounds.

REFERENCES

1. EPA Regulations on National Primary and Secondary Ambient Air Quality Standards, 40 CFR 50, Appendix B, December 6, 1982.

2. NIOSH Manual of Analytical Methods, Vol. 7, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Cincinnati, Ohio, August 1981, Method P & CAM 351.

3. A Method for the Sampling and Analysis of Polychlorinated Biphenyls (PCBs) in Ambient Air, EPA-600/4-78-048, August 1978.

4. "Guidelines for Air Monitoring at Hazardous Waste Sites for Volatile and Semivolatile Organic Compounds using Tenax and Polyurethane Foam Sorbents," GCA/Technology Division, EPA Contract No. 68-02-3168, Work Assignment No. 26, April 1983.

5. Protocol for the Collection and Analysis of Volatile POHCs Using VOST, EPA-600/8-84-007, March 1984.

6. NIOSH Manual of Analytical Methods, Vol. 1, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Cincinnati, Ohio, April 1977, Method 173.

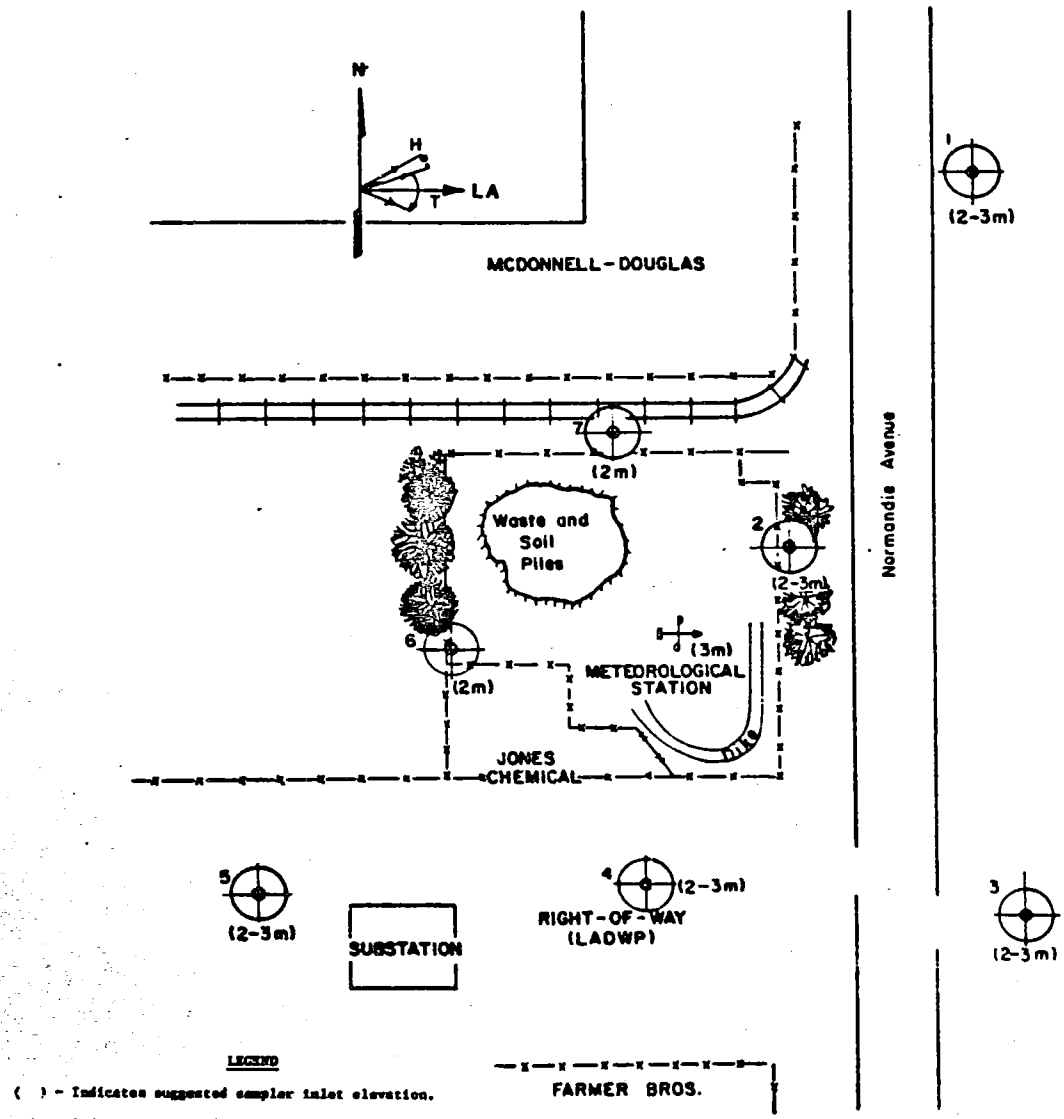


FIGURE 9. SCHEMATIC OF AIR MONITORING NETWORK MONTROSE FACILITY SITE

Task 16 - Evaluation of Data

Upon completion of all necessary parts of the remedial investigation, all data, with particular emphasis on the subsurface investigation data, air monitoring data, sediment data and other analytical results, will be evaluated to prepare a complete site assessment. The assessment will delineate the type, extent, source and pathways of surface water, groundwater, soil and sediment contamination on-site and off-site with particular emphasis on DDT.

Task 17 - Preparation of Remedial Investigation Report

After completion of the remedial investigation, all pertinent field and laboratory data will be assembled into a detailed draft report. The report will include detailed descriptions of the following items:

- Objectives of the remedial investigation.
- A site description, including the environmental setting of the site.
- A Site Base Map including location of on-site soil/debris piles, groundwater monitoring wells and air, soil and sediment sampling locations on-site and within 500 feet of all site boundaries.
- Hydrogeologic conditions at the site with emphasis on the aquifers, possible directions of groundwater flow and rate, and interconnections between aquifers.
- An area map, adapted from USGS topographic maps, which will show any other off-site sampling locations not depicted on the Site Base Map.

- Nature and extent of groundwater contamination.

- Nature and extent of surface water and sediment contamination.

- Nature and extent of soil and/or sediment contamination.

- Nature and extent of fugitive emissions contamination.

- Identification of potential sources of contamination and pathways for this contamination.

- Supporting data, such as soil testing data, well and soil boring logs, chemical analysis reports, meteorological data, rainfall and flow records, and monitoring well water level elevations.

- Conclusions and recommendations.

Task 18 - Remedial Investigation Oversight

This task will be performed by EPA and covers oversight of all remedial investigation activities performed by Montrose Chemical Company. Specific items will include technical assistance in reviewing the Health and Safety Plan, the Quality Assurance Project Plan and Sampling Plans, preliminary and draft technical reports, and oversight of field activities.

SECTION 3

FEASIBILITY STUDY

WORK PLAN

Section 3
PHASE II - FEASIBILITY STUDY WORK PLAN

Upon completion of the final RI report by Montrose Chemical Co. and its acceptance by EPA, the Feasibility Study will be conducted by EPA. Its purpose of the feasibility study is to identify and evaluate appropriate remedial measures, select the most cost effective remedial alternative and prepare a conceptual design of the selected alternative. The feasibility study will be based on existing site information and information obtained during the remedial investigation.

Task 19 - Preparation of Feasibility Study Work Plan (10 days)

A work plan for the Montrose Facility Site Feasibility Study will be prepared. The work plan will present a detailed schedule and budget for the activities to be undertaken. The major tasks of the feasibility study are as follows:

- Development of remedial response objectives and criteria.
- Identification of remedial alternatives.
- Endangerment Assessment.
- Initial screening of remedial alternatives.
- Performance of treatability studies (if applicable).
- Detailed evaluation of remedial alternatives.
- Preparation of preliminary feasibility study report.
- Development of post-closure, long-term monitoring plan.

- Conceptual design of selected alternative.

- Preparation of final feasibility study report.

- Community relations.

Task 20 - Development of Objectives and Criteria for Remedial Action (5 days)

According to the NCP, the objective of remedial action is to permanently prevent or mitigate the migration of hazardous substances into the environment, and the effects of such action. The selection of site specific objectives will consider:

- The extent to which substances pose a danger to public health, welfare, or the environment, including:

  Population at risk

  Amount and form of substances present

  Hazardous properties of the substances

  Hydrogeological factors

  Climate

- The extent to which substances have migrated or are contained by natural or man-made barriers or other conditions

- The experiences and approaches used in similar situations by state and federal agencies and private parties

- Environmental effects and wildlife concerns

Specific objectives that must be met to mitigate the identified problems at the Montrose Facility site will be developed under this task.

Criteria for evaluation of remedial alternatives must provide a standard of judgment for testing the suitability of each remedial measure. Standard criteria for evaluation will include the following:

- Technical Feasibility-Implementability/Reliability
- Mitigating and Adverse Effects on Public Health, Welfare and the Environment
- Capital and Long-Term Operating/Monitoring Costs

Task 21 - Identification of Remedial Alternatives (5 days)

Appropriate remedial technologies will be identified for the site objectives determined in Task 20. These technologies will be evaluated singly and in combinations to determine how well they meet the established remedial action criteria. One or more appropriate remedial technologies will be grouped together as required to constitute the remedial measure.

The identification process for remedial technologies will take into account the type of media contamination, the site specific conditions (soils, geology., etc.), public health and safety concerns, and the existing EPA and California DOHS Hazardous Waste and related regulations.

The results of the RI will be used to develop a list of candidate remedial aiternatives. In general, these alternatives would

include no action, on-site and off-site source control (capping, encapsulation, etc.) and on-site and off-site source removal (excavation with secure final disposal).

Task 22. Endangerment Assessment (20 days)

An Endangerment Assessment will be performed for the No-Action remedial alternative. The objective of an Endangerment Assessment is the determination of the magnitude and probability of harm (exposure and risk) presently or potentially caused to humans, animal or other environmental receptors. The Endangerment Assessment would identify and evaluate site-specific data, qualitatively and quantitatively predict expected hazards or describe actual hazards, provide conclusions regarding potential risks ("endangerment") incurred by the public or the environment, and adequately and reliably document all relevant facts in support of the conclusions. Under CERCLA and the NCP, appropriate remedial response cannot be determined unless the degree of probability of risk is determined first.

Task 23. Initial Screening of Alternatives (10 days)

An initial screening of the remedial alternatives identified in Task 21 would be conducted in order to eliminate from further detailed evaluation those alternatives that are clearly not feasible or appropriate. Four major cost effectiveness criteria will be used in the initial screening:

Technical Criteria. These relate to the implementability and reliability of the alternative. Alternatives which are difficult to implement, which will not achieve the remedial alternatives in a reasonable time period, or which rely on unproven technology will be eliminated from further consideration. Past performance of remedial measures under similar conditions will be considered where appropriate.

Environmental/Public Health Criteria. Alternatives which pose the threat of significant adverse environmental effects, or danger to workers or the general public during implementation, will be eliminated.

Institutional Criteria. Alternatives which are not implementable due to federal/state legislation and/or community acceptance etc. will be eliminated.

Cost Criteria. Alternatives whose total cost (capital and O&M) and post-closure, long term monitoring costs far exceeds those of other alternatives without significant added benefit will be eliminated.

Task 24. Treatability Work Plan (5 days)

As a result of the development and screening of alternatives, the need may be identified for laboratory studies to evaluate the effectiveness of a remedial technology for site specific conditions and to establish design criteria. If this need is identified, EPA will review the requirement with the State, and prepare a work plan for the recommended laboratory studies.

Task 25. Detailed Evaluation of Alternatives (30 days)

The alternatives which remain after the initial screening would be subjected to a detailed evaluation to select the most desirable alternative for recommendation for EPA and the State.

Detailed Development of Remaining Alternatives. To provide the basis for a realistic comparative evaluation of the remaining alternatives, the alternatives will be developed in sufficient detail to provide information necessary for analysis of public health, environmental and institutional issues, technical factors and cost. As a minimum, the following should be included:

1. Description of appropriate treatment and disposal technologies.
2. Special engineering considerations required to implement the alternative (e.g., pilot testing).
3. Environmental impacts, and proposed methods and costs of mitigating any adverse effects.
4. Operation, maintenance and monitoring requirements.
5. Off-site disposal needs and transportation plans.
6. Temporary storage requirements.
7. Safety requirements for implementation.
8. A description of phasing opportunities to reduce environmental impact and/or cost.
9. A description of how the alternative could be segmented into areas to allow implementation in phases.
10. A review of available off-site facilities to ensure compliance with RCRA.

Public Health and Environmental Assessment. An assessment of public health and environmental impacts of all practical remedial alternatives will be performed by experienced environmental specialists in the fields of biology, hydrogeology, environmental engineering, and public health. In some cases detailed assessment of each alternative is performed to compare the risks posed by the No-Action alternative versus the impacts to be created during implementation of each alternative. Differences between short- and long-term public health and environmental impacts of identified remedial actions will also be described. A detailed analysis will be performed if it is expected that a remedial alternative will result in any of the following:

1. A new substantial increase in airborne emissions;
2. An increase in the volume of loading of a pollutant from existing sources or new facility to receiving waters, storm drains etc.;

3. Known or expected significant adverse effects on environmental media or human use of environmental resources; and
4. Known or expected direct or indirect adverse effects on environmentally sensitive resources or areas, such as wetlands, aquifer recharge zones, or areas containing endangered or threatened species.

Each detailed environmental analysis will consist of the following:

1. Identifying effects of each remedial alternative on the release of the contaminants;
2. Estimating reduction (from current condition) of contaminants in the environment;
3. Predicting improvement in the biotic environment from the current scenario;
4. Predicting improvement in human resource use;
5. Predicting the adverse effect of each alternative, if any; and
6. Proposing methods of mitigating predicted adverse effects of each alternative.

The detailed environmental analysis of each remedial alternative will be based on the following criteria:

1. Comparison with existing ambient concentrations standards and criteria.
2. Effect on sensitive environments.
3. Effect on human resource use pattern (fishing, traffic disruption, reduction in property values, loss of employment, etc.).
4. Timeframe of the effects of the remedial response.
5. Environmental effects which might result from failure of the remedial alternative.

The public health assessment of each remedial alternative will consider the expected health risks of the surrounding population during implementation and following completion of each alternative.

Technical Evaluation. A detailed evaluation of the technical feasibility of each remedial alternative under consideration will also be performed. Although technical feasibility was considered in general during the initial screening of alternatives, a detailed evaluation will determine the relative degree of feasibility of each alternative in relation to the other alternatives under consideration. The detailed analysis of technical feasibility will also provide data for use in a subsequent cost-effectiveness analysis of all remedial alternatives.

Criteria that will be used to evaluate the technical feasibility of each alternative include:

1. Reliability
2. Implementability
3. Safety Considerations.

Cost Evaluation. The evaluation of costs for each alternative will be conducted in conformance with evaluation procedures as specified under CERCLA. This cost evaluation of remedial alternatives will consist of the following three steps:

1. Estimates of Costs. Determine capital, annual operating and post closure, long-term monitoring costs for remedial alternatives.

2. Cost Analysis. Using estimated costs, calculate stream of payments and present worth for each remedial alternative.

3. Sensitivity Analysis. Evaluate risks and uncertainties in cost estimates.

Cost-Effectiveness Methodology for Analysis of Alternatives. The objective of the cost-effectiveness analysis is contained within the National Contingency Plan which states: "The appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment)."

The site-specific criteria which will be applied uniformly to each remedial alternative to evaluate its cost-effectiveness include:

1. Cost
   - Capital cost
   - Operations and maintenance (O&M) cost
   - Annual capital cost
   - Annual or present worth O&M cost
   - Total annual cost (sum of annual capital cost and annual O&M cost)
2. Technical
   - Proven or experimental technology
   - Risk of failure
   - Length of time required for cleanup
   - Feasibility/Implementability/Reliability
3. Public Health
   - Reduction of health and environmental impacts
   - Level of cleanup/isolation achievable
4. Institutional
   - Acquisition of necessary federal, state, and local permits
   - Role of adjacent landowners (e.g., right of entry)
   - Community impacts

5. Environmental

- Relevant environmental criteria
- Impact of failure
- Length of time required for cleanup
- Carrying capacity of the environment
- Ability to minimize adverse impacts during action
- Ability to minimize off-site impacts resulting from activities on-site.
- Remoteness of activities (from nearby residences)
- Usability of surface water and groundwater.

A trade-off matrix will be prepared by the contractor and submitted to EPA for review. This matrix would list along the left-hand side of the table those remedial alternatives under consideration, with corresponding effectiveness criteria and weighting factors across the top of the table. The trade-off matrix will be used to rate the various remedial alternatives based on the chosen criteria. Weighting factors are applied to the individual effectiveness criteria, which are rated for each alternative, and a final score (sum of ratings times weighting factors) is calculated for each alternative. The trade-off matrix is an effective means of presenting the determination and rationale behind the selection of the most cost-effective remedial response.

Task 26. Preparation of Preliminary Feasibility Study Report (15 days)

A preliminary feasibility study report will be submitted to the EPA which will incorporate any previous interim reports and detail all work completed in the feasibility study. The preliminary report will present the recommended remedial action alternative and will provide the rationale behind its selection as being environmentally sound and cost-effective.

Task 27. Development of Post Closure, Long-Term Monitoring Plan (5 days)

A detailed post closure, long-term monitoring plan will be completed for the selected, cost-effective remedial alternative. A monitoring period to determine the effectiveness of the implemented alternative will be selected in consultation with the appropriate state and EPA officials. The plan will include a description of all the various tasks which will be accomplished during the monitoring program. The costs associated with the implemented monitoring plan will ultimately depend upon which remedial alternative is finally selected for the site

Task 28. Preparation of Draft Final FS Report and Final FS Report (15 days)

A Draft Final Feasibility Study Report will be prepared and submitted to the U.S. EPA for review and comment. The Draft Final Report will incorporate the conceptual design of the cost-effective remedial alternative selected by the U.S. EPA into the previously submitted Report. Any comments/revisions will be incorporated into the Draft Final Report.

Appended information will include at least the following:

- Site topographic map with ground control data.
- General arrangement drawing of remedial measure.
- Typical geologic and design cross-sections.
- Typical design details.
- Design report with supporting calculations.
- Erosion and sedimentation control plans, if applicable.
- Construction health and safety plan
- Preliminary cost estimates.

Task 29. Conceptual Design of Selected Remedial Measure (10 days - ?)

A conceptual design of the selected remedial measure will be prepared for use in development of detailed construction plans. The design will be based on the findings of the remedial investigations and the remedial measures evaluation.

The conceptual design will include general arrangement drawings and specifications. The remedial investigation will be a companion document to the conceptual design plan.

The conceptual design plan will include the following:

- The selected engineering approach with implementation schedule.
- Any special implementation requirements.
- Applicable design criteria.
- Preliminary site layouts.
- Budget cost estimates including operation and maintenance cost figures.
- Operation and maintenance requirements.
- Safety Plan including costs.
- Equipment and construction functional specifications.

Any additional information required as the basis for the completion of the final remedial design will also be included.

Task 30. Community Relations Support (ongoing)

Under this task, the contractor will provide assistance to EPA implement those tasks developed in the CRP (Task 8 under RI) that occur during the Feasiblity Study phase. Tasks are expected to include preparation of fact sheets and other information releases and logistic and technical support at public meetings and during public comment period(s).